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THE IRON AGE

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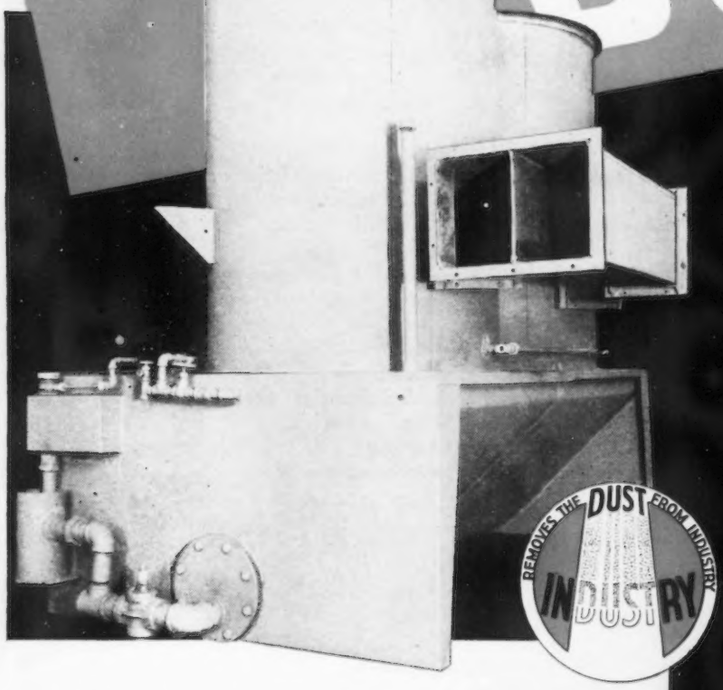

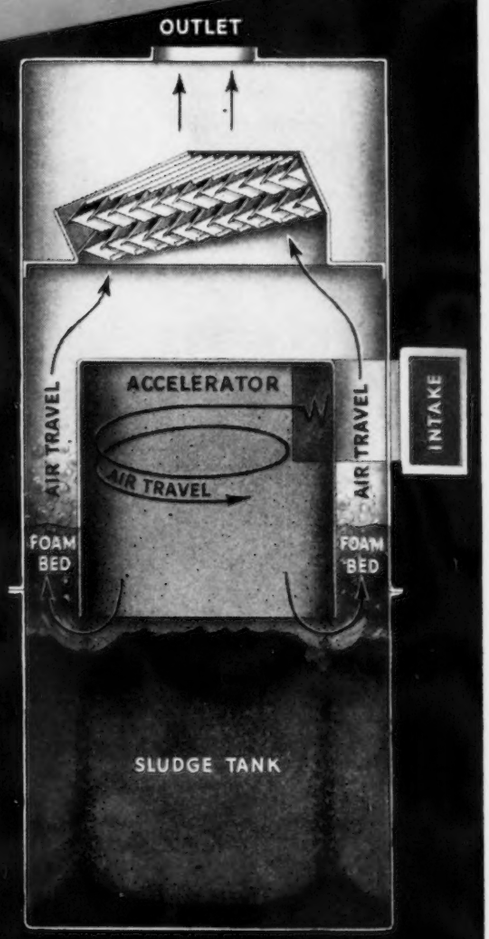

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"In This Corner, the Winnah!"

AFTER a championship fight, in Madison Square Garden or elsewhere, the winner and the loser shake hands if the latter is able. And the news photographers record their facial expressions.

Only once in my lifetime have I seen a loser look more cheerful after a championship bout than the winner and that was in the recent sporting event when John Lewis knocked the stuffing out of President Truman and all of his seconds.

It must be nice to absorb such punishment so amicably but unfortunately the President, Mr. Krug and the galaxy of administrative seconds were not the only ones injured by the lefts, rights and in-betweens of the redoubtable punches from the coal miners. Indeed, most of the 130 million spectators were fouled and their injuries will not heal with time but will grow worse by this winter.

It is fitting that a champion should wear the belt and carry the title. Perhaps it is not constitutional but since bushy-brows has licked the government maybe he should head it.

Such a move might well be the solution of our present management-labor difficulties since it would present to President Lewis some problems and responsibilities not as one-sided as those that he now enjoys. For example, he would represent some 130 million members of our big American union instead of a few hundred thousand miners.

Being in favor of free enterprise, as he has so often stated, John would have to do his best to preserve it and that would, as he has also stated from time to time, mean the preservation of fair profit margins. And that, in turn would mean uninterrupted operation of our industries, our mines, our transportation and other services.

Representing all the people instead of a few of them, John would naturally find some way to prevent small pressure groups from imposing their will upon the rest of us and thereby exacting tribute or gaining a preferred position.

Knowing that wages are an important item in cost and price and that the value of wages as well as the competitive position of America in world trade are periled by inflation, champion John would surely suggest a practical and prompt method to end the vicious spiral of wage and price boosts.

I am sure it would be a relief to all of us to have such a stalwart and braving champion as John turn his talents to lifting all of us to an economic heaven instead of pushing us in the opposite direction.

You and the other "labor leaders", John, have plenty of criticisms for the plans that our legislators have evolved for doing just this but I have not heard any of you present better ones. Remember, a champion must defend and justify his title. How about it?

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NEWSFRONT

► New wrinkle was seen in New York steel black market when salesman promised immediate delivery on wire if order was placed direct with him rather than with his company. There is also a brisk undercover market in fractional hp motors.

► New frozen food container marks first use of metal in this field. American Can container with fiber walls and aluminum coated bonderized black plate ends expected to use 1100 tons this year, 3300 tons in 1947.

► Export curbs on most steel products were slated to go out on July 1, instead new items have been added due to strikes and to CPA housing allocations.

Export sales have become more difficult because commissions on royalties, etc., can no longer be handled through a single European agency, must now be paid direct to the country involved.

► The Lees-Bradner Co. will shortly introduce a radically new type of gear checking machine that uses no master gear or pitch circle, and is little bigger than a typewriter. It is said to have only six moving parts.

► Cooling fins for German aircraft radiators were made at the Opel factory by pressure welding two sheets of thin aluminum in a closed die, and introducing compressed air to blow open the spaces between the pressure points.

► Welding and cutting of stainless steel can now be accomplished simultaneously with multiple tip gas welding torches developed at Ryan Aeronautical Co.

One such torch has three flame tips--a special pair of natural gas tips plus the oxyacetylene tip. With this torch welding speed can be increased to 6 ipm, and oxidation of the metal is prevented by the flow of postheating gas which protects it from the air.

► Use of aluminum for food cans in Norway is said to have developed to the point where aluminum is definitely threatening the supremacy of tinplate for this use.

These containers, used in the Norwegian fish canning industry, are reported to be made of unalloyed aluminum and are deep drawn on automatic presses.

The Norwegians have developed a continuous process for anodizing aluminum strip used in can making. Details have not been made public.

► In spite of the carbon pickup in stainless steel aircraft exhaust manifolds, design or excessive heat have been found to be the principal cause of failure, not intergranular corrosion.

► Tightness in deliveries of die casting machines in this country and efforts of the British to expand exports have combined to encourage the sale here of a fairly large number of British made hand operated die casting machines. These units, while slow and of limited size and scope, have aided a number of plants by taking care of pressing small volume work.

► A 30,000-ton forging press, the world's largest, was used in an I. G. Farbenindustrie plant in 1944 to forge magnesium aircraft parts.

► Dealers are said to be collecting as high as $200 per car for immediate delivery of new automobiles ordered under priority according to the old British licensing system for new purchases.

► The nickel chloride plating bath for rapid deposition of heavy nickel plate at high current densities and lower power consumption has not been adopted widely because it is said not to be suitable for bright plating. Other reported disadvantages are the corrosive nature of the solution which would require the development of corrosion resistant pumping and filtering apparatus, and the inadequacy of the present plating bus bar installations.

► In lieu of the customary mine holiday from June 29 to July 8 coal miners will be off for the 4-day July 4 weekend only in order to make up in small measure for the loss of coal during the 2-month strike.

► CPA is under increased pressure from some companies to reinstitute a system of priority controls. It would seem that these persons have mastered the art of talking from both sides of their mouths for while decrying existing government regulations, they would have discarded ones returned.

The solution to CPA is conservative purchasing on the part of large buyers. This in the long run, they say, would be more beneficial to industry in general.

► Battlefield scrap may finally be brought into this country to make up for the scrap shortage. Only rub so far is to determine who will pay for its transportation.

► The anticipated increase in pig iron prices will result in an increase in ingot mold costs, despite previous predictions otherwise. Mold prices, based on iron prices plus conversion costs which consist of labor, coke, sand, and other required materials and overhead charges, will most likely be increased in direct proportion to the increase in iron prices.

FIG. 1—For butt welds on material over 1/8-in. thick, whether beveled or not, it is advisable to notch the edges as shown here, to facilitate penetration and generally improve the weld.

How to Weld

THOUGH sometimes considered a difficult material to weld, aluminum is, in fact, one of the most readily weldable of all metals. It has, however, individual characteristics which must be thoroughly understood. It must be remembered, for example, that pure aluminum melts at 1218°F, while aluminum alloys melt at even lower temperatures. The melting point of steel is around 2700°F.

One of the two most critical factors in the welding of aluminum is oxidation. On all exposed surfaces, aluminum oxides readily form a film or coating. Though aluminum derives its corrosion-resistant qualities from this oxide, it must be removed before sound welds can be made. Its removal is complicated by the fact that it has a higher melting point than the base metal. In the various forms of fusion welding, this difficulty is overcome by the use of fluxes. The flux combines chemically with the oxide to form a fusible slag which may be removed readily from the weld puddle, as it rises to the surface during welding.

The other critical factor is the apparent weakness of aluminum alloys at high temperatures. Many aluminum alloys are partially molten over wide ranges of temperature. When temperatures at which partial melting occurs are reached in welding, the aluminum alloys show a tendency to collapse.

Because the temperatures used in welding aluminum are not within the visible light range, showing no changes of color, it is difficult to determine when melting temperatures are approached in any part of a piece of metal being welded. This is contrary to the circumstances in welding most other metals, where welders know the temperature by the color of the heated piece and, therefore, can heat to the desired range.

This condition also necessitates precautions to avoid subjecting the hot metal to shrinkage and reaction stresses. Adequate support is a positive necessity for all of the areas of an aluminum object which are to be subjected to appreciable temperature rises. In designing the support for an aluminum weldment, it must be remembered that heat applied to the edges to be welded soon spreads rapidly through the entire piece because of the high thermal conductivity of aluminum.

There are two major groups of wrought aluminum alloys: (1) non-heat treatable alloys and (2) heat treatable alloys. The non-heat treatable alloys can be strengthened only by means of cold work. The heat treatable alloys require suitable thermal treatment to develop optimum properties.

Wrought aluminum alloys are known commercially by a series of letters and numbers (2S, 24S, R301, etc.) arbitrarily assigned by the producers. Alloy designations indicate definite chemical compositions, but unlike designations for certain other materials they have no relation to each other.

Temper designations, as follows, are suffixed to the alloy designation to signify mechanical or thermal treatment:

Non-heat treatable group	F	as fabricated	produced by a definite amount of cold work
	O	annealed or soft	
	¼H	one-quarter hard	
	½H	one-half hard	
	¾H	three-quarter hard	
	H	full hard	
Heat treatable group	O	annealed or soft	
	W	solution heat treated	
	T	solution heat treated and aged	

Some heat treatable alloys are not produced in the W temper because after quenching they rapidly age at room temperature to the T temper. Alloys which are produced in W temper may be converted to T temper by a low-temperature, artificial aging treatment. Nominal mechanical properties for sheet products will be found in table I.

Commercially pure aluminum, or 2S, is the most weldable aluminum alloy. This non-heat treatable alloy contains a minimum of 99 pct aluminum and small quantities of iron and silicon, present as impurities. Because of its high purity, 2S has excellent corrosion resistance and workability, but low strength.

For applications requiring slightly higher strength and similar welding characteristics, 3S is frequently used. It is a non-heat treatable alloy containing a minimum of 98 pct aluminum and from 1 to 1½ pct manganese.

Another non-heat treatable alloy, 52S, has approximately twice the strength of 3S. It is an aluminum-magnesium-chromium alloy, combining strength with good corrosion resistance and workability. It is somewhat more difficult to fusion weld than the other non-heat treatable aluminum alloys, but it can be resistance welded equally as well as 2S or 3S. For best results, butt or edge welds should be made rather than lap or fillet welds, since it is more subject to cracking near the weld zone.

The heat treatable alloys of aluminum are in general

Aluminum . . .

FIG. 2—Proper jigging is necessary when welding aluminum, in order to provide adequate support for the work and to prevent distortion or collapse of the various units due to the heat of the flame.

A review of modern techniques employed in welding aluminum, including gas, carbon arc, metallic arc, atomic hydrogen and resistance welding, as well as brazing and soldering, is presented in this series of four articles prepared by the engineering staff of Reynolds Metals, Inc., Louisville. This, the first article of the series, covers in detail the weldability of various aluminum alloys and the technique of gas welding.

not as suitable for welding as the non-heat treatable alloys. These alloys, however, if heat treated subsequent to welding, develop higher strengths, but if welded after heat treatment much of the strength will be lost.

R353 is a heat treatable aluminum-magnesium-silicon-chromium alloy of intermediate strength. Its weldability is considerably better than that of 52S. This material should not be welded by a fusion process if a full strength joint is desired.

R361 is similar to R353, but has slightly higher strength. This material, used extensively in architectural and furniture fields, where strength and weldability are essential, is an aluminum-magnesium-silicon-copper-chromium alloy.

The dural type aluminum alloys, such as 17S, 24S, and R301, may also be welded. In the heat treated condition, resistance welding is the only form of welding favorable to these alloys. Fusion welding not only produces a material having considerable reduction in strength, but also embrittles the metal in the area adjacent to the weld. Corrosion resistance is also seriously impaired. Reduction in corrosion resistance is similarly marked in clad alloys welded by the fusion method because of diffusion into the cladding.

To summarize, 2S, 3S, 52S, R353 and R361 may be welded by either gas or resistance welding processes. Generally, these materials can also be welded by the metalarc or carbonarc process as well as by the atomic hydrogen process. The inert gas shielded arc welding process, wherein the arc is shielded in an atmosphere of helium or argon, is likewise adaptable to the welding of certain of the aluminum alloys. The dural type alloys should be welded by the resistance welding process for best results.

When cold work tempers of non-heat treatable alloys are welded, all the effects of previous cold work are removed. The heat necessary to weld the material softens or anneals it. This fact must be remembered whenever welding is applied to cold work tempers of non-heat treatable alloys used in a product because of the increased strength imparted by the cold working. Annealed material, however, when welded, has essentially the same strength as before welding. In some instances, the weld metal may even show higher mechanical properties than the annealed parent metal.

Heat treatable alloys welded in the W or T conditions do not return to the fully annealed condition as a result of the heat of welding. However, the strength of the parent metal in the vicinity of the weld is lowered considerably. The extent of the loss in strength cannot be predicted inasmuch as there is a degree of heat treatment imparted to the weld area by air-quenching as the torch moves along the weld seam. The reduction in strength can be determined accurately only by tensile strength tests.

Gas Welding

The earliest welding process to be successfully employed on aluminum, and still one of the most popular, is that method of fusion welding which makes use of the torch flame. Oxyhydrogen or oxyacetylene processes are generally preferred to oxybutan, oxypropane or oxynatural gas combinations. Though the latter gases are used in aluminum welding, they are somewhat more costly than hydrogen or acetylene because of their slower welding speeds. However, the finished weld produced by an oxybutane or oxypropane gas process is usually sound and satisfactory.

Gas welding is normally confined to materials 1/32-in. thick or over. For thinner materials, spot or seam welding is employed. Many of the gas welding processes may be used to weld aluminum alloys in their various forms such as sheets or plates. Alloys suited for general torch welding purposes are 2S, 3S, 52S, R353 and R361.

The thickness of the material will largely determine the method of edge preparation. As a rule, the edges are prepared in the same manner as the edges of simi-

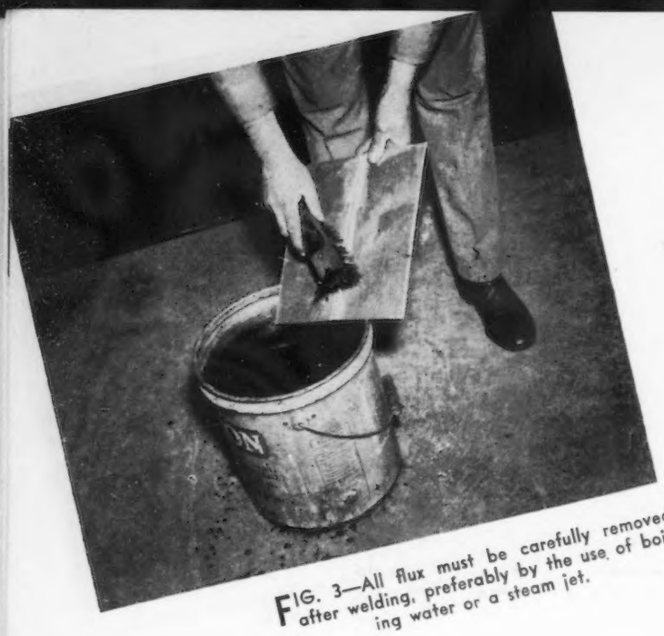

FIG. 3—All flux must be carefully removed after welding, preferably by the use of boiling water or a steam jet.

lar thicknesses of steel. There are, however, noteworthy differences.

On thin material up to about 1/16 in. no particular edge preparation is needed. Material of this thickness can usually be welded with a plain butt type of weld.

TABLE I

Nominal Mechanical Properties for Aluminum Sheet Products

Alloy	Yield Strength 1,000 psi	Tensile Strength 1,000 psi	Elongation Pct in 2 in.
2S-O	5	13	35
2S-¼H	13	15	12
2S-½H	14	17	9
2S-¾H	17	20	6
2S-H	21	24	5
3S-O	6	16	30
3S-¼H	15	18	10
3S-½H	18	21	8
3S-¾H	21	25	5
3S-H	25	29	4
17S-O	10	26	20
17S-T	40	62	20
24S-O	10	26	20
24S-T	45	68	19
Pure Clad 24S-O	10	25	20
Pure Clad 24S-T	41	62	18
52S-O	14	29	25
52S-¼H	26	34	12
52S-½H	29	37	10
52S-¾H	34	39	8
52S-H	36	41	7
R353-O	7	16	25
R353-W	20	33	22
R353-T	33	39	14
R361-O	8	18	22
R361-W	21	35	22
R361-T	39	45	12
R301-O	10	25	20
R301-W	42	62	20
R301-T	62	69	11
R303-O	15	30	18
R303-T275	73	79	9
R303-T315	69	75	9
Clad R303-O	14	29	18
Clad R303-T275	69	75	10
Clad R303-T315	65	72	9

NOTE: Definition of letter designations: O—Annealed; H—Full hard; W—Quenched, not aged; T—Fully heat-treated.

The only requirement for the joint design is that the edges be straight and square.

If desired, these thin sheets (including those up to about ⅛ in.) may be welded with a flange type of joint. In this case, the edge of each sheet is bent to form a flange having about the same height as the sheet is thick. The flange is melted down in the welding operation and provides sufficient filler metal to render unnecessary the use of a filler rod in these thin gage welding operations.

Unbeveled butt welds may be made on sheets up to 3/16-in. thick, but in these applications it is necessary to notch the sheets with a saw or a cold chisel in a manner similar to that shown in fig. 1. Edge notching is recommended in aluminum welding because it serves to facilitate full weld penetration and also prevents local distortion and minimizes the likelihood of burning holes through the joint. Another important service of the notches is to provide channels down which flux may flow to the bottom of the weld. All butt welds in material over ⅛-in. thick are generally notched in some manner.

In the gas welding of plates over 3/16-in. thick, it is desirable to bevel the edge to secure thorough penetration. The included angle of bevel may be 90° to 120°. Single vee welds may be used on material up to about 7/16 in. In either event, notching is also recommended to supplement the beveled edges.

After the edges of the pieces have been properly prepared, the surface to be welded should be cleaned of grease, oil and dirt. If the edges are heavily oxidized, it may be necessary to etch, but as a general rule wire brushing is sufficient for oxide removal. The presence of grease and oil may necessitate the use of gasoline, naphtha, carbon-tetrachloride or similar solvent to complete the cleaning job.

It is desirable to preheat when welding aluminum plates ¼-in. thick or over in order to prevent cracks, assure more complete penetration and reduce gas consumption. Preheating to a temperature of 500° to 700° F is sufficient. Thin sheet aluminum should be warmed with the welding torch prior to welding; even this slight preheat helps to prevent cracks.

It is important that the preheating temperature does not exceed 700° F inasmuch as the desirable properties of certain aluminum alloys may be destroyed at higher temperatures. In preheating, if a pyrometer is not available, a mark made with carpenter's blue chalk will turn white at the proper preheating temperature for aluminum welding. Or, if the part to be welded is rubbed with a pine stick, the mark will char at the proper preheating temperature. Again, cold aluminum gives a metallic ring when struck; this sound becomes duller as the temperature rises and disappears entirely at the temperature required for welding. Proprietary temperature indicating pellets, etc., may also be used.

In preparing aluminum for gas welding it will be found highly desirable to jig and sometimes tack weld the material whenever possible. Proper jigging, as shown in fig. 2, gives adequate support to the parts being welded and thus helps greatly to avoid distortion, buckling and collapse of the items to be joined at high temperature.

A welder undertaking the gas welding of aluminum is often confronted with the problem of choosing between oxyacetylene and oxyhydrogen welding processes. In general, it has been found that oxyhydrogen welds are equivalent in every respect to oxyacetylene

welds. With the oxyhydrogen flame sufficient heat is produced to weld aluminum up to ⅜-in. thick. For practical purposes, however, many users are inclined to reserve oxyhydrogen welding for the thinner sheets and use oxyacetylene welding for thicker materials, say from 3/16 in. up.

No matter what type of welding process is used, considerable care must be exercised to ascertain that a neutral flame is employed. In welding aluminum, a neutral or slightly reducing flame gives the best speed and economy as well as a clean weld of good soundness. Should the flame become oxidizing, it will cause the formation of aluminum oxide, resulting immediately in poor penetration and a defective weld.

A neutral flame may be distinguished quite readily in oxyacetylene welding. It is secured by first increasing the amount of acetylene until a feathery cone is produced and then gradually reducing the amount of acetylene until the luminous cone becomes well defined. The luminous cone is a true indication of a neutral oxyacetylene flame. A neutral oxyhydrogen flame, though not so readily distinguished, is indicated by a well defined blue cone near the torch tip. A neutral oxyacetylene flame is obtained by using a mixture of equal volumes of oxygen and acetylene. The neutral oxyhydrogen flame, however, results when the hydrogen volume is approximately twice that of the oxygen.

Best results will be obtained in the gas welding of aluminum alloys when the proper size welding tip is used. The size of the tip varies with the thickness of the material to be joined as is shown in table II. Of course, the selection of the proper tip for use in welding aluminum alloys is largely a matter of experience, due allowance being made to take into consideration the configuration of the weldment and other uncontrolled factors. Table II, therefore, is merely a guide, and for this reason a range of tip sizes has been indicated. The more experienced welder will be able to use the larger size tips and thereby increase his welding speed. The pressures indicated are also dependent upon the skill of the operator.

TABLE II

Torch Welding Data for Aluminum of Various Thicknesses

	Oxy acetylene			Oxyhydrogen*	
Aluminum Sheet Thickness (in.)	Tip Orifice Diameter (in.)	Oxygen Pressure Psi	Acetylene Pressure Psi	Tip Orifice Diameter (in.)	Hydrogen Pressure Psi
1/16	0.021 -0.031	1+	1	0.031 -0.0465	1-3
1/8	0.025 -0.038	1-2	1-2	0.038 -0.055	2-4
3/16	0.031 -0.0465	1-3	1-3	0.0465-0.067	3-5
1/4	0.039 -0.055	2-4	2-4	0.055 -0.076	4-6
3/8	0.067 -0.086	5-7	5-7	0.086 -0.110	7-9
1/2	0.076 -0.098	6-8	6-8	0.098 -0.1285	8-10

* Hydrogen may be burned with oxygen in the same tips used with acetylene. However, since the flame temperature is lower, larger tip sizes, as indicated, are necessary. Exact oxygen pressures for oxyhydrogen welding are not given for the reason that, first, a wider range of adjustment is possible and, second, it is common practice to use slightly reducing flames with hydrogen, the exact adjustment of which is largely a matter of experience. Theoretically, two volumes of hydrogen are required to burn one of oxygen; in actual welding practice, at least 2½ volumes are used, and under some circumstances as much as three or four volumes may be employed. Obviously, with such wide discrepancies as encountered in actual practice a reasonable table of pressures cannot be given.

Welding Rods and Fluxes

The type of welding rod to be used will vary in accordance with the particular aluminum alloy that is to be welded. For welding 2S or 3S, a pure drawn aluminum wire (2S) is generally recommended, although for some lap joints a 5 pct silicon welding rod will produce slightly better results. This is also true for the welding of aluminum castings.

The 5 pct silicon welding rod is likewise recommended for the other alloys, that is, 52S, R353, and R361, inasmuch as this rod possesses higher strength and good corrosion-resistant properties. This material covers a wide and low melting range and has complete solidification well below the usual alloy. Consequently, it remains plastic after the base metal, which has a higher melting range, has cooled. This characteristic makes it possible to shift any stresses set up by contraction, stresses which might cause cracking of the base metal on cooling, to the still plastic welding deposit.

Table III may be used as a guide for selecting the proper size of welding rod for various thicknesses of base metal.

The use of the proper fluxes in the welding of aluminum is extremely important. It has already been noted that aluminum welding flux is designed to remove the aluminum oxide by chemically combining with it. The oxide forms rapidly in the molten weld pool, and, unless it is removed, a defective weld is sure to result. To insure the proper distribution of flux, it should be painted on the surface to be welded and also applied to the welding rod.

Aluminum flux is generally obtained in the powder form. It is best prepared by mixing the powder with water to form a thin, freely flowing paste. The paste should preferably be kept in aluminum, glass or earthenware vessels and not in steel or copper containers as these metals tend to contaminate the mixture.

It will be found advantageous to apply flux to the prepared edges of the sheet or plate so as to prevent additional oxidation of these surfaces during the preheating and welding operations. It is particularly essential that adequate flux be applied to the edges of flanged joints since no filler rod is used in this welding operation. In all cases, the flux should be applied to

FIG. 4—Forehand welding is recommended wherever possible. The flame points away from the completed weld and preheats the edges to be welded.

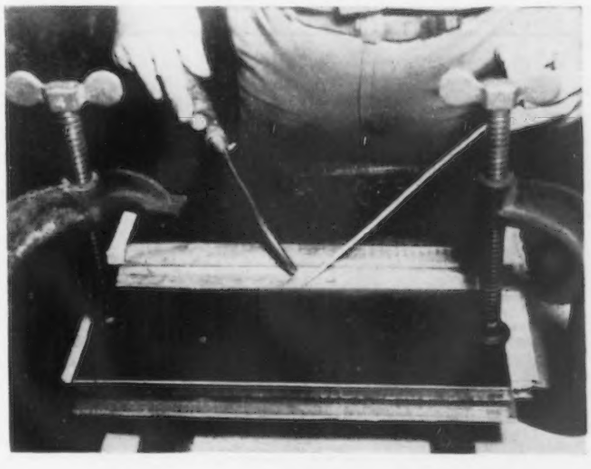

TABLE III
Welding Rod Sizes

Thickness of Plate or Bar (in.)	Welding Rod Size (in.)
Up to 0.064	3/32
0.065 to 0.155	1/8
0.156 to 0.249	5/32
0.250 to 0.374	3/16
0.375 and up	3/16 or 1/4

both the top and bottom sides of the sheet in the area of the weld.

Care should be taken to remove all traces of adhering flux upon completion of the welding operation. It is recommended that the parts be washed in boiling water wherever possible. A steam jet, however, may be used for cleaning them, where steam is available.

Immersion in cold 10 pct sulfuric acid for 30 min, or in 5 pct sulfuric acid held at 150°F for 5 to 10 min, has also been found to be a satisfactory cleaning method. Another method used is to immerse the parts in cold 10 to 50 pct nitric acid for 10 to 20 min. Either one of these immersion procedures should be followed by rinsing the parts thoroughly in hot or cold water. The acids should be kept in containers made of crockery, wood or acid-proof brick.

If so desired, butt welds in 2S and 3S may be peened at room or elevated temperatures. Peening produces a smooth surface finish, refines the grain structure, improves corrosion resistance, eliminates porosity, raises strength and reduces internal stresses. Peening of the beads in heat treatable alloys is not recommended. The weld bead and the material in the transition zone work hardens more rapidly than the adjacent metal. Failure by cracking may occur under the hammer.

Welding Technique

After the pieces to be welded have been properly prepared and fluxed, the flame is passed in ever smaller circles over the starting point until the flux melts or the rod begins to adhere to the surface. One of the difficulties sometimes experienced in aluminum welding is the failure of the deposited metal to adhere. This is generally caused by attempts to deposit the weld metal on cold base metal. After the flux melts, the base metal must be melted before the rod is applied, or else the metal and the filler metal may be brought to the molten state simultaneously. To prevent oxidation, it is quite essential to keep the welding rod in the weld puddle at all times.

Forehand welding is generally considered best for the welding of aluminum since the flame points away from the completed weld as shown in fig. 4, and thus preheats the edges to be welded. Too rapid melting is also prevented. The torch should be held at a low angle (less than 30° above horizontal) when welding thin sheets. For thicker sheets, 3/16 in. and above, the angle of the torch should be increased to nearer the vertical. Changing the angle of the torch to accord with the thickness minimizes the likelihood of burning through the sheet during welding.

When welding sheet aluminum, there is little need to impart any motion to the torch other than moving it forward. On flanged sheets, care should be taken to break the oxide film as the flange melts down. This task may be accomplished by stirring the melted flange with a rod.

With aluminum plate and heavy sheet above 3/16 in., the torch should be given a uniform, but not unduly lateral motion in order to distribute the weld metal over the entire width of the weld. A slight back and forth motion will assist the flux in its removal of oxides. The rod should be dipped into the weld puddle periodically and withdrawn from the puddle with a forward motion. This method of withdrawal closes the puddle, prevents porosity, and assists the flux to remove the oxide film. Aluminum welds should be made in a single pass as far as possible. This is especially true of alloys other than 2S or 3S.

It must be remembered that the angle of the torch has much to do with welding speed. Instead of lifting the flame from time to time in order to avoid melting holes in the sheet, it will be found advantageous to hold the welding torch at a flatter angle, thus increasing the speed. The speed of welding should also be increased as the edge of the sheet is approached.

While the previous discussion concerns welding in the flat position, it is well to add that aluminum can also be welded in the vertical position. In this instance, the torch is given an up and down rather than a rotating motion. On thicker materials it will be found advantageous to use two torches, one on each side of the joint, so that the weld may be completed on both sides at the same time. The rod is stirred in the weld puddle as in the case of flat welding.

Most aluminum fabrications, particularly in the making of metal furniture and architectural products, call for materials of good weldability and high strength. As a rule, R353 or R361 alloys are used for such applications. These materials can be welded quite readily by gas, and the welding technique is quite similar to that used for the non-heat treatable alloys. However, the greater likelihood for contraction strains, leading ultimately to cracking, necessitates a slight change in the general welding procedure.

Heat treatable alloys should be jigged for welding. The clamps of the jig should be placed as far as possible from the joint so that there will be less stress in the weld and hence less danger of cracking. The likelihood of cracking can be eliminated greatly by the use of a 5 pct silicon-aluminum welding rod. Having a lower melting range than the aluminum alloys being joined, this rod permits the base metal to solidify before the weld pool freezes. As the weld is the last area to solidify, all of the contraction strains will be in the weld bead rather than throughout the base metal.

TABLE IV
Minimum Tensile Strength of Gas-Welded Aluminum Alloys

Material	Alloy	Thickness (in.)	Min. Tensile Before Welding Psi	Min. Tensile After Welding Psi
Sheet	2S-½H	Up to 0.249	16,000	11,000
Sheet	3S-½H	Up to 0.249	19,500	14,000
Sheet	52S-½H	Uo to 0.249	31,000	27,000
Plate	R353-W	Up to 0.500	28,000	20,000 (2)
Plate	R353-T	Up to 0.500	35,000	20,000 (2)
Casting	43	Up to 0.500	17,000 (1)	12,000
Casting	214	Up to 0.500	22,000 (1)	12,000

(1) Tensile strengths of standard ½ in. test specimens individually cast in green sand molds and tested without machining. (2) Values given are for specimens tested in the as-welded condition, not reheat treated.

In the welding of heat treatable alloys, it will be found that cracking may be lessened by tack welding the parts while they are in the jig and then loosening the clamps before completing the seam.

In welding heat treatable alloys, the weld should be made in one pass. Single pass welding, incidentally, is usually cheaper and more economical than multiple pass welding.

Extreme care must be exercised in peening welds on R353 or R361 alloys because of the tendency towards cracking during this operation. Should a flush bead be desired, it may be obtained by chipping the weld bead as closely as possible and the peening lightly for the finishing operation. Welds on heat treatable alloys may be finished very satisfactorily by grinding or buffing.

R353 and R361 have satisfactory metallurgical characteristics imparted to them by solution heat treatment. Welding naturally destroys some of the effects of this heat treatment by lowering the strength of the parent metal in the weld zone. Hence, it is not generally possible to predict the strength of such materials following welding. If it is necessary to know the strength of a particular type of joint accurately, it is recommended that individual welds be tested.

Annealed R353 and R361 alloys can be welded without effect upon the mechanical properties. In fact, it is not at all unusual to find that the weld is stronger than the base metal. Table IV lists a few of the minimum strengths which should be obtained from gas-welded aluminum alloys.

Aluminum castings are generally welded only as a means of repairing foundry defects or to repair castings broken in service. Seldom is welding used in order to assemble units from castings. While there are several methods of welding castings, the most acceptable and the one generally used is the flux and puddling rod process. This method involves the use of a puddling rod which rod is essentially a paddle flattened and shaped from a ¼ in. round low-carbon stainless steel rod.

When repairing castings, it is generally found that the base metal lacks the strength and ductility of wrought aluminum and at the same time may be cracked and dirty. The complicated shape of many castings intensifies shrinkage stresses and increases cracking. All of this makes the welding of aluminum castings a complicated procedure.

Preheating to prevent the spreading of cracks is essential for many castings. Furnace preheating is generally preferred, although in some instances local torch heating may do the job in small castings or for small cracks near the edge, and thin sections of large castings. Prior to preheating, it is advisable to drill a hole in the end of the crack in order to prevent it from spreading.

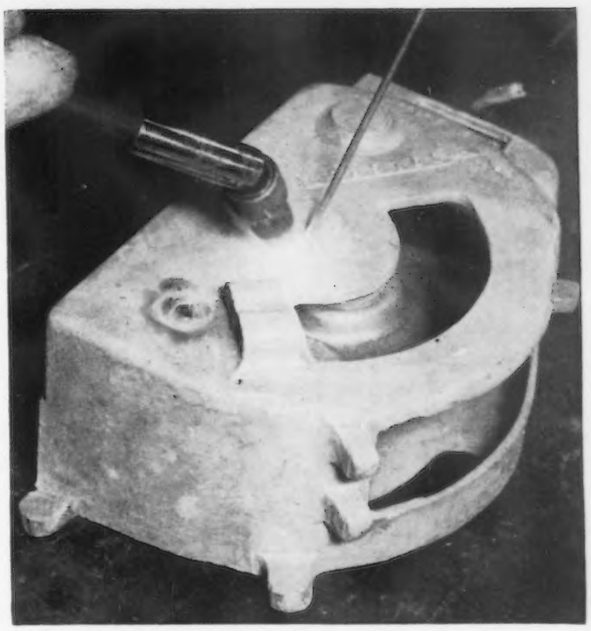

FIG. 5—Aluminum castings may be repaired by welding provided proper care and the correct technique is employed.

The preheated crack is next coated with a flux. A flux that is good for sheet aluminum will work quite satisfactorily with castings. In any event, a satisfactory flux is essential, as is a puddling rod. When the metal along the edges of the crack becomes mushy under the flame, a vee 2 or 3 in. long should be scraped out with a puddling rod. The flux-dipped aluminum welding rod is then melted into the veed section, and either the paddle or the welding rod is used to scrape the bottom and sides of the weld puddle and to level off the top of the mushy weld metal. As soon as one short section is filled, another section should be started. Only the hot fluid metal is puddled. The direction of the flame is immaterial as long as the molten material is not being driven over the edges of the bevel.

Continuously Anodized Aluminum Strip for Cans

A SPECIAL process for the production of continuously anodized aluminum strip has been developed in Norway, according to a report published in *"Light Metals,"* London, April, 1946. This process was developed in connection with the use of aluminum cans for fish canning. While details of the anodizing unit have not been made public, it is said that the quality of the film is such that it successfully withstands the can drawing process, leaving the protective powers of the film unimpaired. Some breakdown does occur, according to the report, but it does not appear to present any difficulty and the corrosion resistance of the anodized surface of the finished can is markedly superior to that of the bare metal.

Further research is expected to make possible the production of cans for every purpose in pre-anodized unalloyed aluminum. Lacquering may have still to be used in certain circumstances, however, it was stated.

Use of aluminum for canning in Norway is said to have developed to the point where aluminum is a definite threat to the supremacy of tinplate for cans. Cans used in the Norwegian fish canning trade, on which the report is based, have been produced solely by means of deep drawing on automatic presses. The material used is said to be unalloyed aluminum, except in the case of cans for kipper fillets where an alloy with 1.25 pct Mn has proved more suitable.

Production lines in Norway are at present limited to turning out open top cans. One can described in the report, used for anchovies, consisted of a body with a side seam and a rolled-on bottom and top. The metal was pre-anodized strip, lacquered on the inside

Carbon Absorption Of 18-8 Stainless Steel

By WILSON G. HUBBELL
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An investigation to determine whether the stainless steel use for aircraft exhaust manifolds picks up carbon from the high temperature exhaust gases is reported in this article. Microphotographs and carbon differences covering several hot and several cool operating areas for a number of burned-out manifolds are given.

RECENT studies conducted by the engineering laboratory of this company have disclosed some interesting information on the use of 18-8 stainless steel for high temperature aircraft exhaust applications. These experiments show that there is a carbon pickup in exhaust manifolds during their service life which varies with time, temperature, and possibly type of fuel, and that the formation of the carbide network is not accompanied by any substantial intergranular corrosion.

It is well known that the most valuable characteristic of the basic 18-8 Cr-Ni stainless steels, that of resistance to corrosion and oxidation, is attributable to the chromium which they contain in amounts of over 17 pct and nickel in amounts of more than 7 pct. The application of heat can, however, cause a change in the microscopic structure of the stainless steel which substantially reduces its corrosion resistance. This heat may be experienced in fabrication by welding or in service life where high temperature applications are involved.

One of the most exacting uses to which stainless steel has been put is in aircraft exhaust manifolds. The steel from which they are constructed must be strong and corrosion resistant, not only at ordinary temperatures, but under service conditions which may fluctuate rapidly from temperatures of —50°F to 1700°F.

As a major producer of aircraft exhaust systems, the Ryan company has had to meet the flow of new problems which each increase in engine horsepower has presented. In the course of continual metallurgical investigation of high temperature behavior, the question has been restudied as to whether the stainless steel used in aircraft exhaust manifolds picks up carbon from the exhaust gases which might affect the corrosion resistance of the metal.

The theory behind this investigation concerns the vital role which carbon plays in the behavior of the 18-8 stainless steels. When the chromium-nickel steels are held within the 800° to 1500°F. temperature range for an appreciable time and then allowed to slowly cool, they lose a portion of their corrosion resistance. Theoretically, this is due to a change in microscopic structure in which the carbon separates out of solid solution and unites with the chromium to form a network of chromium carbides along the grain boundaries. This network presents a path for intergranular corrosion. How the corrosion actually progresses is a matter of several conflicting opinions.

Some earlier considerations of the problem of intergranular corrosion of 18-8 *stainless are discussed by the author in the article "Result of Stabilizing Heat Treatment on Welded* 18-8 *Stainless,"* THE IRON AGE, *June* 21, 1945, *p.* 56.

The additions of columbium, in type 347 stainless steel, and titanium in type 321, to the 18-8 formula are methods of preserving the steels' corrosion resistance through the critical temperature range. These stabilizing elements combine with the precipitated carbon and form harmless carbides which are well distributed throughout the steel and therefore cannot provide a path for intergranular corrosion.

The higher the percentage of carbon which the steel contains, the greater will be the tendency to form harmful precipitated carbides. Further, the greater the percentage of the carbon content with respect to the sum of the chromium-nickel percentages, the more harmful will be the carbide precipitation. For example, a steel with a carbon content of 0.08 pct and a chromium-nickel content of 25 pct will form harmful carbides more rapidly than one with a carbon percentage of 0.08 pct and a chromium-nickel content of 27 pct—other things being equal.

With these basic facts in mind, it becomes quite important to ascertain all the conditions which might change the carbon content of stainless steels which rely heavily upon corrosion resistance, as in the case of the aircraft exhaust system structure. One suspected source of carbon pickup available to the exhaust manifolds in actual service is the high temperature exhaust gases themselves. This laboratory procured several exhaust manifolds which had failed in service and subjected them to a series of tests to

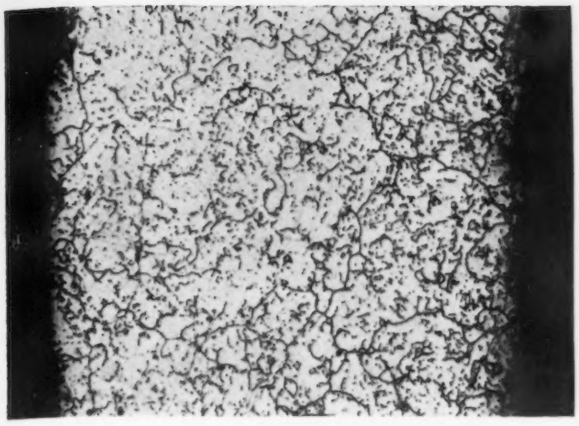
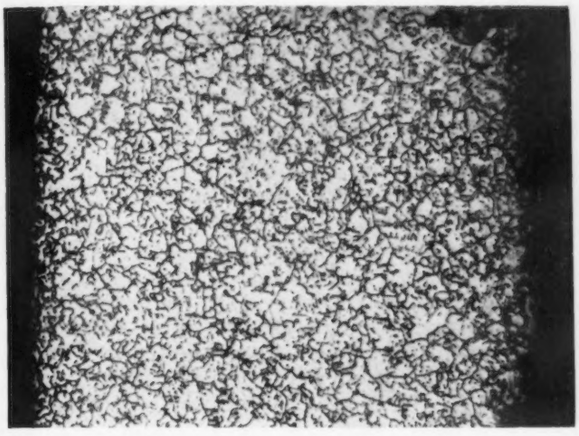


FIG. 1—Cross-section of manifold No. 3 which burned out after 400 hr service. Top section shows a section of the coolest operating area, while micro below covers the hottest area. Original magnification of 100X reduced about a half in reproduction.



determine whether carbon pickup from exhaust gases contributed to their failure.

Due to the impossibility of obtaining the heat number of the steel used in the manufacture of the manifold collector rings investigated, the carbon pickup was determined on a comparison basis by analyzing two different sections of a stamping in a given collector. The sections were selected from that part of the collector subjected to the most severe conditions, such as direct impingement of exhaust flames or poor cooling characteristics resulting in local hot spots, and that part of the manifold having the opposite in conditions, such as maximum coolness and remoteness from areas of direct exhaust impingement. The use of this method of determination by comparison could allow a carbon pickup which would be greater than that reported because there is usually a slight pickup in even the coolest sections of a collector stamping.

Photomicrographs and carbon analyses were made in the Ryan laboratory of each of the sections examined except manifold No. 1, which was not examined microscopically. The carbon analyses were as follows:

Manifold No. 1—Burned out in a hot spot after 650 hr	
Area of failure — analysis No. 1	0.115 pct C
Area of failure — analysis No. 2	0.115 pct C
Opposite area of failure — analysis No. 1	0.09 pct C
Opposite area of failure — analysis No. 2	0.085 pct C
Manifold No. 2 — In service 4000 hr without failure	
Area of greatest carbon absorption analysis No. 1	0.107 pct C
Area of greatest carbon absorption analysis No. 2	0.105 pct C
Opposite area of greatest carbon absorption analysis No. 1	0.083 pct C
Opposite area of greatest carbon absorption analysis No. 2	0.080 pct C
Average carbon pick up	0.024 pct C
Manifold No. 3—Burned out in a hot spot after 400 hr	
Area of failure—analysis No. 1	0.105 pct C
Opposite area of failure—analysis No. 1	0.104 pct C
Average carbon pick up	0.001 pct C
Manifold No. 4—Burned out in a hot spot after 725 hr	
Area of failure—analysis No. 1	0.139 pct C
Opposite area of failure—analysis No. 2	0.073 pct C
Average carbon pick up	0.066 pct C

Electrolytic sodium cyanide etch was used to reveal the presence of carbides.

An examination of the photomicrographs (electrolytic sodium cyanide etched) made from the collector sections shows that there is a marked increase in the

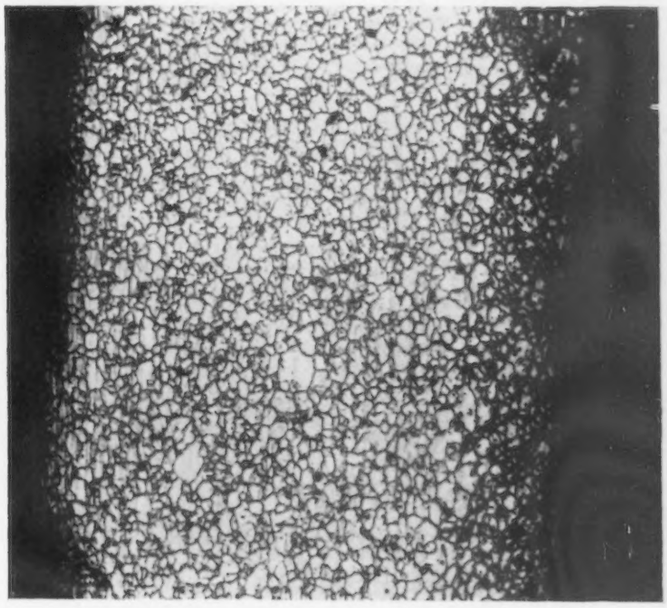
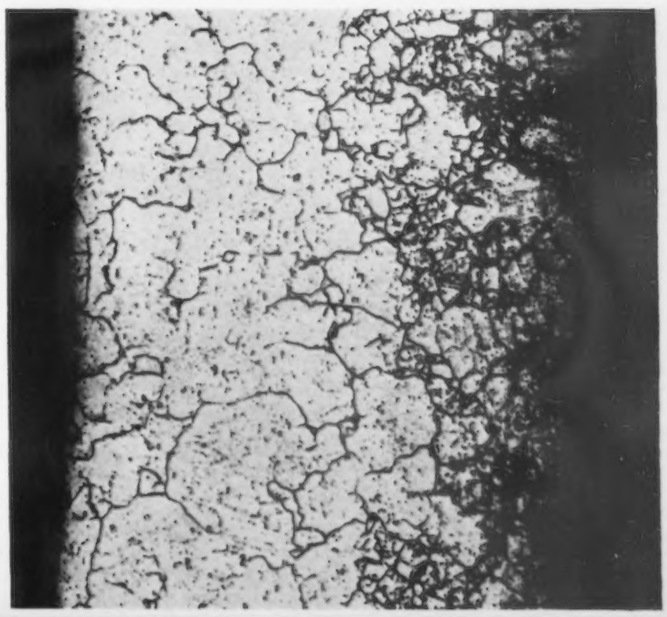


FIG. 2—Section of manifold No. 4 Micro above is from the coolest operating area, while section below is from the coolest area. Grain growth and heavy carbide penetration is indicated in this specimen. Original magnification of 100X reduced about a half in reproduction.



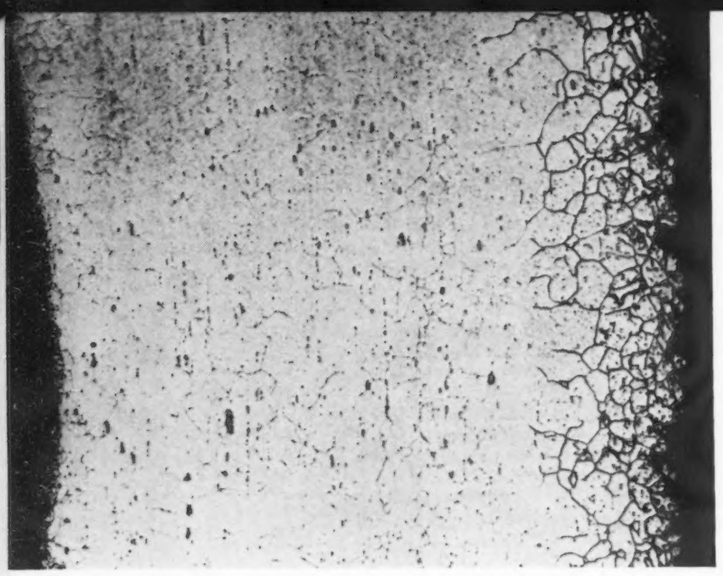
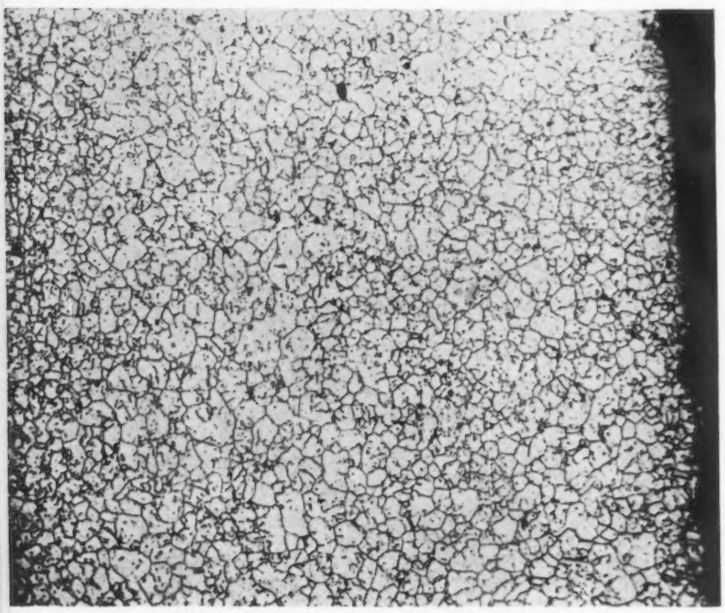


FIG. 3—Micrograph of cross-section of manifold No. 2 in service 4000 hr without failure. Top micro was taken of the coolest operating area, while the section above is from the hottest area. Original magnification of 100X, reduced approximately a half in this reproduction.



carbon content from the coolest to the hottest zones, with one exception. Collector No. 3 shows no significant increase from one area to another but does show an increase in the total carbon content. Photomicrographs, fig. 1, bear out the fact that the total carbon content is approximately the same in both areas and suggests that the section upon which the investigation was made had uniformly high temperatures on both areas from which the carbon samples and photomicrographs were taken.

Photomicrograph on manifold No. 4, fig. 2 (top) shows a heavy penetration of carbides on the inside of the manifold body while photomicrograph, fig. 2 (bottom), indicates a heavier distribution penetrating through the section. Also, the grain size has increased tremendously, denoting very high temperatures.

Photomicrographs of manifold No. 2, fig. 3, show the same condition in which there is a complete penetration and a heavy deposition of carbides throughout the body of the manifold in the area nearest the hot spot and a partial penetration of carbon in the cooler area. Photomicrograph, fig. 4, is a section of weld zone taken from manifold No. 2 in the hottest area. It is unetched and shows the presence of intergranular corrosion which has progressed less than 0.005 in. None of the photomicrographs examined revealed any intergranular corrosion except that from manifold No. 2, in spite of the heavy carbide network which they exhibited.

The conclusions drawn from these investigations confirm our belief that there is a carbon pickup in exhaust manifolds during their service life which varies considerably with time, temperature and possibly type of fuel. This pickup varied from 0.023 to 0.06 pct in the exhaust collectors which were examined.

Although this carbon evidently contributes to the formation of a heavy network of carbides, as shown by the photomicrographs, the corrosion resistance of the stainless steel does not appear to be materially reduced. Manifold No. 2 did not fail in service even after 4000 hr and yet the photomicrographs, fig. 3, indicate an even carbide precipitation.

In manifolds No. 1, 3 and 4 there was no evidence of intergranular corrosion in spite of their failures. These manifolds failed because of excessive temperatures, due to poor cooling conditions, which produced scaling of the metal. This type of failure is becoming more prevalent with the trend toward higher operating temperatures which higher horsepower engines are imposing.

There has been considerable speculation on the cause of some aircraft exhaust manifold failures. Most investigators in the field, not acquainted with the phenomenon of carbon pickup, from exhaust gases, have attributed these failures to the presence of the precipitated carbides. Most photomicrographs taken from exhaust systems which have been in service for relatively short periods will show this carbide network.

In all of the cases where the investigations made in the field have been checked, these failures have been due to design considerations or excessive temperatures

FIG. 4—Section of the weld zone in the hottest area of manifold No. 2. Micro has not been etched to show the presence of intergranular corrosion of less than 0.005 in.

and not to the presence of precipitated carbides and intergranular corrosion.

Why the carbide networks formed from picked up carbon in exhaust manifolds are not accompanied by intergranular corrosion is a question which should deserve additional study. It may be that these carbides, formed over extended periods at relatively low temperatures, are less harmful than those formed suddenly as in the case of sensitized type 302 stainless steel.

Another theory which has been considered in the Ryan laboratory is that there might be some progressive intergranular attack which keeps pace with the build-up of carbides in the exhaust manifold but which is removed as rapidly as it occurs by the rush of high velocity exhaust gases which scour the surface.

The fact that most of the interiors of these manifolds present, in relief, the type of wearing away called erosion seems to give credence to this theory. Several cases in which exhaust systems have worn to almost paper thinness without failure have been found.

Automatic Press Finishes ID of Tubes

AUTOMATIC finish sizing and surface conditioning of the ID of steel tube shock absorber housings are currently being done by one manufacturer at a rate of 720 tubes an hr on a single machine. The operation consists of pushing hardened steel balls through the tubes to finish them to 1 in. ID.

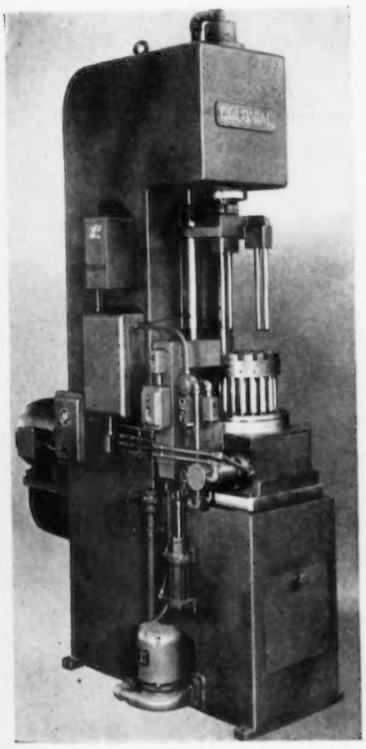
For this purpose the company employs a Colonial Utility hydraulic press equipped with automatic indexing fixture. An automatic loading and feed mechanism for the balls was also built into the machine.

The installation operates on a continuous cycle. The operator drops the tubes, two at a time, into the indexing fixture at the loading station. As will be noted from fig. 1, the ram of the press is fitted with a head having four push rods. The two toward the column of the machine are for pushing the balls through the tubes, two tubes at a time. The two rods at the right of the machine are for ejecting the finished tubes from the fixture. The automatic ball feed mechanism is at the left.

Fig. 2 shows a close-up of the fixture with the ball chutes in the background. As the fixture indexes two tubes in front of these chutes, triggers release two balls which roll into position on top of the open end tubes. In the next station, the balls are pushed through. The balls then drop into a lower hopper and are raised into the upper hopper by the hydraulically operated feed mechanism which is interlocked with the machine cycle. More than two balls are used in the machine of course, the design of the feed mechanism being such that the raising of two balls positions two other balls in the chutes ready for release by the trigger mechanism.

When the finished tubes reach the station at the extreme right of the machine, the two rods in the foreground of fig. 2 push the tubes down and out of the fixture, the tubes dropping out through an opening in the side of the machine base.

Operation of the machine is hydraulic throughout, including the index and feed mechanisms. Indexing takes place near the top of the automatic return stroke, just before the ram starts down again. The machine has a rating of 6 tons with an 18-in. adjustable stroke.



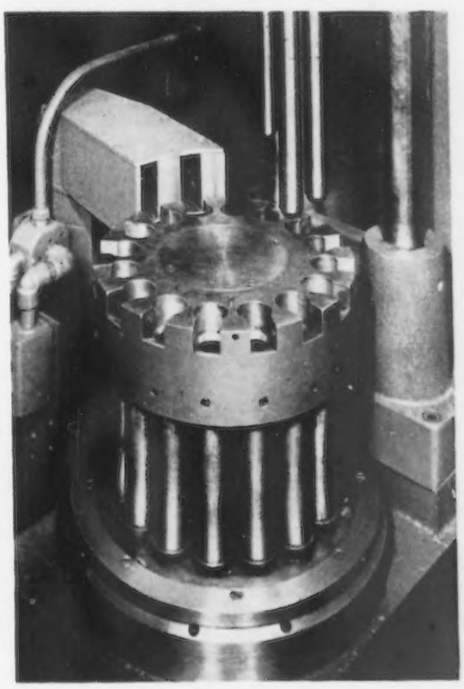
LEFT

FIG. 1 — Hydraulically operated, and fully automatic, this Colonial press is capable of sizing 720 tubes an hour by pushing hard steel balls through them.

o o o

RIGHT

FIG. 2—Close-up of the special indexing fixture and automatic ball feed mechanism. Balls are automatically returned to the chute after use, and finished tubes ejected through the side of the machine base.



High Temperature Alloys

By N. J. GRANT
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Following a brief discussion of the microstructures of the Ni-Cr-Co-Fe base alloys, the author explores the Vitallium alloys with respect to physical properties and the effects on properties of (1) mold preheat and (2) heat treatment. High temperature failure and strength and ductility comparisons among the alloys are also presented.

USING P-2 as the point of origin of these alloys it appears that the P-2 series is overbalanced in its alloy composition toward the brittle carbide side. The tendency of the carbides is to be both continuous (95P-2) and massive (116P-2), either of which would cause a more brittle alloy. By changing P-2 to N-2 through the change of 20 pct nickel to 30 pct nickel, the system was balanced more favorably with respect to the austenitic phase thereby producing a more ductile but stronger alloy. In alloy 115N-2 the carbides are much less continuous and massive than in alloy 116P-2 which has essentially the same carbon. Again as the carbon goes up to 156N-2 the carbides again become very massive and an alloy as brittle as the P-2 alloys results.

This is the concluding part of a four-part article. The preceding sections, published in the issues May 23 and 30 and June 6, have dealt with the chemical composition and high temperature physical properties of forging and casting alloys and the effects on properties of various factors. The tests covered by this report have been performed for the Navy under Bureau of Ships Research Memorandum No. 1-45.

Carbon, within fairly broad limits in all the alloys tested, increases the high temperature strength at the expense of the ductility while improving the resistance to creep at the same time. As the carbon increases, a more fully defined dendritic pattern of carbide meshes results in the cast structure, both insofar as continuity and massiveness are concerned.

The relative continuity and massiveness of the carbide meshes determine to a very great extent the ductility, strength and creep resistance of the alloys. Of course, the compositions of the austenite and carbide are the other very important factors. The coarser the carbide mesh pattern, without becoming either massive or very continuous, the stronger the alloy.

Undesirable types of structures were contained in the following alloys: (1) 156N-2—massive and quite continuous carbide network, (2) 123M-1 and 136M-1—fine carbide meshes which are too continuous, and (3) 37SA-2 and 82SA-2—extremely heterogeneous structure with carbides not in most beneficial mesh-like arrangement.

Nitrogen appears from microexaminations to have a beneficial effect on the structure and distribution of the carbides by breaking up the continuity of the carbide meshes. This benefit appears greatest for the creep stresses.

In considering the relative effects of tantalum and columbium it must be kept in mind that similar amounts of either element are not available in any one series of alloys. For example, the NT-2 alloys with 2 pct tantalum appear superior to the N-2 alloys with 1 pct columbium. In comparing alloys TE and TF in the forged group it is also to be noted that comparable amounts of tantalum and columbium are not present. However, excluding the question of amount the evidence at present is in favor of tantalum as an alloying element.

Vitallium Type Alloys

The results of rupture tests conducted at 1500°F and 30,000 psi on plain, high carbon Vitallium alloys and high carbon vitallium modified by substituting 2 pct tantalum for 2 pct cobalt indicate that, without question, the VT2-2 alloys are superior to the V-2 types for the same carbon content except for alloy 127V-2 (which it has been impossible to reproduce). Not only has the high value of 372 hr not been reproducible, but all the other tests conducted on bars from the same melt were extremely poor at all stresses. In turn the V-2 alloys have shown better ductility than have the VT2-2 alloys, but poorer creep resistance. The best alloy in this system in all around performance to date is 111VT2-2 at both 1500° and 1600°F.

Alloy 94V-2 (actually 96V-2) is the next best in all around performance.

Several alloys in the V-2 series with carbon greater than 1.20 pct have been made during the writing of this report—the rupture results have been extremely poor. In general, it might be said that the reproducibility of the V-2 and to a smaller extent the VT2-2 alloys is considerably more difficult than in the case of the Ni-Cr-Co-Fe base alloys. These latter alloys have been very reproducible in every sense of the word.

It is very interesting to know that the effect of increasing carbon on high temperature strength is the same in the Vitallium type alloys as in the Ni-Cr-Co-Fe base alloys. There does appear to be one difference, however, and that is that increasing carbon while

greatly enhancing the strength properties does not decrease the hot ductility to any great extent. While it is impossible to plot a curve due to the extreme scatter of points, table XIV shows the change in elongation values as the carbon increases for tests conducted at 30,000 psi and 1500°F.

A curve through either set of points is impossible. In this respect the Vitallium alloys are extremely different from the Ni-Cr-Co-Fe base alloys. These latter alloys not only showed a regular change in ductility as the carbon increased but also as the time at test increased.

As to the strength values of various modified Vitallium compositions with respect to the standard V-2 and VT2-2 curves, the alloy with 2 pct nickel appears to compare best with the VT2-2 alloys. One of two tests on alloy 116V-1 which had a small amount of nitrogen added also compares favorably. Otherwise it appears that at 30,000 psi and 1500°F the addition of 2 pct tungsten, or 2 pct zirconium, or 8 pct nickel, or 4 pct tantalum is not beneficial.

Table IX shows, however, that at 1600°F, alloys 117VT-4 and 97V22-2 compare much more favorably with the best VT2-2 alloys. In this same respect, it should be pointed out that although at 1500°F the rupture values of the best Vitallium type alloys far exceed those of alloy 102NT-2, at 1600°F the rupture values of 102NT-2 are very close to the best high carbon Vitallium results, indicating the possibility that at temperatures of 1600°F and higher the Ni-Cr-Co-Fe base alloys may achieve superiority in strength properties at rupture loads.

The initial test results at 1600°F strongly indicate that the strength relationships of various alloys whether in the same basic system or not may change their order as the test temperature is changed.

Effect of Mold Preheat Temperatures — Vitallium alloys cast into room temperature molds have very poor strength properties. By raising the temperature to 1500°F, the strength increased by a factor of greater than 2. By changing the preheat temperature from 1500° to 1850°F an additional increase in strength was achieved, again by a factor of greater than 2. In going from 1850° to 2250°F it is questionable from the test data whether any further increase in strength was achieved. In the Ni-Cr-Co-Fe system, tests cast into a mold at room temperature also gave extremely low rupture life and tests from a mold preheated to 2250°F also gave poorer results than the 1850°F molds, but only a small margin here (see table VI).

Tests were conducted on alloy 102VT2-2, with the surface of the wax pattern impregnated with very fine tungsten powder prior to investing. The rupture strength is considerably lower than the standard curve indicates for this alloy. The microstructure did appear to be affected by the sprayed coat in that the carbide meshes seemed to be smaller and more continuous.

Effect of Heat Treatment—In the study of the effect of heat treatment of the Ni-Cr-Co-Fe base alloys it was found that a high temperature solution treatment followed by water quenching was very beneficial. This is not the case at all with the Vitallium type alloys. Fig. 2 shows the effect of various treatments. In no case was it possible to duplicate or exceed the as-cast strength of the alloy with the treatments used thus far. There was a large change in the ductility of the alloys as is shown in table XV. All tests were at 30,000 psi and 1500°F.

Furnace cooling appears less damaging whereas air cooling is considerably more harmful. The ductility can be better than doubled by a 2000°F furnace cool.

The purpose of this study was to note the effect of overheating Vitallium base alloys, which always happens when welding operations are performed. The tests were at temperature for ½ hr prior to cooling. This may be too long a time for a study which is meant to duplicate welding conditions. Other tests are being made where overheating occurs for periods of 2 to 5 min prior to cooling.

Ni-Cr-Co-Fe Base v. Vitallium Alloys—At rupture loads at 1500°F the Vitallium type alloys shows lower creep rates, greater strength and greater ductility than do the best Ni-Cr-Co-Fe base alloys.

At creep stresses at 1500°F the Ni-Cr-Co-Fe base alloys show better and better creep resistance than do the Vitallium base alloys; as lower stresses are approached, however, the Vitallium base alloys appear to possess better ductility.

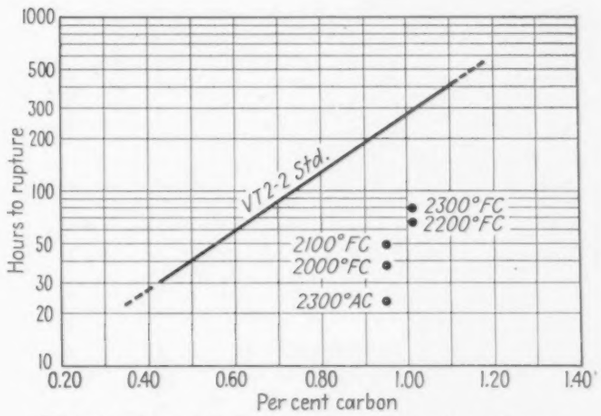

FIG. 2—Effect of heat treatment on VT2-2 alloys. FC=furnace cool, AC=air cool. Tested at 30,000 psi and 1500°F.

At rupture stresses at 1600°F the Ni-Cr-Co-Fe base alloys show less weakening relatively than do the Vitallium base alloys as the temperature increased from 1500° to 1600°F. Again the Vitallium base alloys hold a large advantage with respect to ductility.

With respect to microstructures both alloy systems appear quite similar, both possessing the carbide network in an austenitic matrix.

High Temperature Failure

There has been considerable time and effort spent in investigating the cause of failure at high temperatures, at high stresses and combinations of both. The role of time at temperature has been an additional puzzling factor.

Attempts had been made to determine a so-called equicohesive temperature—that temperature above which, due to the stress, the material fails with a relatively brittle fracture which follows grain boundaries (or phase boundaries), and below which failure occurs as a relative ductile process in a transcrystalline manner. It is that temperature, then, above which a material fails by cleavage due to the strain rate, rather than by the continuous process of transmitted slip.

It has been found in this work that all the failures

TABLE XIV

Percent Elongation for Vitallium Alloys of Increasing Carbon

Alloy	Elongation, Pct	Alloy	Elongation, Pct
84V-2	15.3	40VT2-2	8.1
93V-2	13.6	70VT2-2	12.7
94V-2	10.4	77VT2-2	14.7
110V-2	10.5	91VT2-2	7.9
112V-2	13.6	101VT2-2	7.9
116V-2	6.5	111VT2-2	8.3
127V-2	8.0	125VT2-2	7.1
147V-2	12.0		

were of the brittle intercrystalline type in the cast alloys.

Six heat-treated Ni-Cr-Co-Fe base alloys containing from 0.19 to 1.10 pct carbon were ruptured at loads of 20,000 or 30,000 psi, after being in test from 68 to 1841 hr at 1500°F. The elongations varied from 4 to 16 pct. Three additional tests made in the as-cast condition showed the fracture times decreased by a factor of 3 to 10 and the elongations increased by a factor of about 4. These latter three tests also showed a relatively nonductile fracture which was intergranular.

From the data encountered in the report thus far it must be assumed that these alloys are under test conditions which place them above the equicohesive temperature at 1500°F.

X-ray evidence in the first consideration has shown that alloy 111N-2 after 1841 hr at 20,000 psi and 1500°F is made up of a matrix of cubic austenite, some complex carbide lines and a third set of unidentified lines (probably the aging constituent). These latter lines have not been found in X-ray patterns of the as-quenched alloy. Second, it has been noted that various etching reagents react at an accelerated rate on those alloys which have been tested as compared to as-quenched alloys, indicating that a chemical change had occurred during testing. Third, photomicrographs also indicate an aging constituent by the appearance of a stain-like zone near the phase boundaries in the rupture tested alloys.

The above three observations indicate that on being subjected to strain and/or temperature these Ni-Cr-Co-Fe base alloys in the solution-treated, quenched stage undergo an aging phenomenon. The precipitate vastly decreases the inherent ductility of the alloys and aids in producing an intercrystalline failure on overaging.

In the as-cast condition aging is not as important a factor with the result that considerably more ductility is attained at the expense of a shorter rupture life; however, the fracture is still intercrystalline.

A great many attempts have been made to duplicate the carbide phase in the Ni-Cr-Co-Fe base alloys by the preparation of synthetic carbide combinations of all sorts but thus far no success has resulted.

TABLE XV

Properties of Heat Treated VT2-2 Alloys

Alloy	Heat Treatment	Hours to Rupture	Elongation, Pct
91VT2-2	As cast	180.0	7.9
95VT2-2	2300° F, air cool	23.0	2.4
	2000° F, fce. cool	37.0	18.4
	2100° F, fce. cool	48.6	16.8
101VT2-2	2200° F, fce. cool	66.0	6.4
	2300° F, fce. cool	78.3	1.6
	As cast	207.0	7.9

Strength and Ductility

The question of cold ductility comes into consideration as a result of the problem of handling blades and baskets of various materials during assembly work. Accordingly, alloys 94V-2, 127V-2, 147V-2, 86N-2, 87N-2, 93NT-2, 105N-1B, 11ON-1D, and 115NT-1B were pulled to failure in tension.

The high carbon Vitallium alloys show somewhat greater tensile strengths than do the Ni-Cr-Co-Fe base alloys but in no case do the former attain 1 pct cold ductility. The as-cast Ni-Cr-Co-Fe alloys show poorer tensile strengths than the heat-treated tests but surprisingly also show less cold ductility; the order of the latter property is reversed by a wide margin at 1500°F.

The heat-treated high carbon Ni-Cr-Co-Fe alloys also show better cold elongation values than do the Vitallium alloys.

What the room temperature tensile strength and elongation values signify concerning the use of these materials at high temperatures is highly questionable. How well these same properties indicate the ability of blades and baskets of these alloys to be manhandled without damage is also questionable. The information is included, however, as a matter of interest.

Summary

This report covers an intensive research program in which 37 low carbon forging grades of high-temperature, high-strength alloys of the nickel-chromium-cobalt-iron and nickel-chromium-iron base types, 80 cast alloys of the same type with generally much higher carbon, and 37 cast alloys of the Vitallium type with small composition variations have been tested in both rupture and creep at 1500° and 1600°F. In addition some room temperature tensile tests have been completed. Extensive metallographic and X-ray examination of all the alloys was made for various treatments. A close study was made too of heat treating variables on both the rupture life and ductility of all the alloy systems. Mold preheat temperatures have been investigated to determine the optimism preheat temperature for the best all around alloy performance.

In the cast Ni-Cr-Co-Fe alloy groups it has been found that the optimum carbon content lies at 1.00 pct carbon up to 1.20 pct depending on the alloying elements and the quantities added to the base compositions.

High temperature strength is found to be increased by the addition of carbon in all the systems under investigation. In the Ni-Cr-Co-Fe systems the ductility suffers at the expense of the strength; however, in the Co-Cr-Mo system the strength is increased to very high proportions without any appreciable loss in hot ductility.

At 30,000 psi and 1500°F the best alloys in the cast Ni-Cr-Co-Fe system are 99NT-2 with 109.5 hr, 115N-1D with 124.7 hr and 102NT-2 with 105 hr.

At 25,000 psi and 1500°F the best alloy in the same group is 99NT-2 with 542.4 hr.

In creep at 1500°F and at 15,000 psi the three best Ni-Cr-Co-Fe base cast alloys are 121N-1B with 0.00001 pct per hr, 108N-2 with 0.00002 pct per hr and 104NT-2 with 0.00003 pct per hr as minimum creep rates. These rates are the best reported of all the materials tested in the broad high temperature research program.

In the Vitallium type group the best all around properties at 1500°F were shown by alloy 111VT2-2 (2 pct tantalum for 2 pct cobalt). At 30,000 psi it showed 297.3 hr; at 25,000 psi it had 1093.4 hr.

In creep at 1500°F, alloy 111VT2-2 also showed the best results of the Co-Cr-Mo system; but at 13,500 psi its minimum rate of 0.000034 pct per hr was considerably below the best results shown by several of the Ni-Cr-Co-Fe base cast alloys.

At 1600°F in the Ni-Cr-Co-Fe type alloys, 102NT-2 showed the high figure of 148.0 hr at 25,000 psi, and 805 hr at 20,000 psi.

At 1600°F in the Co-Cr-Mo group, alloy 111VT2-2 was again tops with 122.2 hr at 25,000 psi (considered a low value), and 960 hr at 20,000 psi.

The best Ni-Cr-Co-Fe base alloy, therefore, showed less deterioration than did the best Co-Cr-Mo alloy in going from 1500° to 1600°F.

It has been determined that 2260°F followed by water quenching is the best heat treatment for the cast Ni-Cr-Co-Fe base alloys; that aging may or may not help the high temperature strength; that 30 pct nickel is better for the high carbon N-155 type alloy than is 20 pct; that tantalum seems to be a better alloying element than columbium; that nitrogen improves the strength in the N-2 series, improves the ductility slightly in both the N-2 and NT-2 series and appears to be more effective in the alloys when tested at creep stresses.

It has further been shown that polishing the surface of test samples can bring about considerable improvement in the strength of Ni-Cr-Co-Fe base alloys. All test failures have been found to occur by an intergranular method.

Material Thickness No Barrier to Presswork

ONE of the most significant trends in product design of recent years has been the increasing use of metal stampings to replace both castings and forgings, and presses of all kinds are becoming an increasingly important item of equipment. Indicative of the tremendous span covered by these machines are the two examples of presswork shown in the accompanying illustrations. The part at the left is made from aluminum foil 0.001-in. thick, and measuring 2½-in. long by 1⅜-in. wide. It was made by the Mattison Stamping Works, Chicago, as a shim used in precision aircraft work. The other is a stamping made from 3½-in. steel by Lukens Steel Co., Coatesville, Pa.

This latter is a head section for a melting tank used in the chemical industry, and measures 4 ft 3 in. high by 4 ft 11 in. wide by 1 ft 10¾ in. deep. The radii are 7½, 17, and 26 in., and the section weighs approximately 4300 lb. It was made in a single operation with a triple-acting die forming the bottom round and the top round.

The die equipment weighs approximately 21 tons, and the main body of both the male and female dies are made of cast iron. The ring was reinforced and bolted to a heavy steel plate, and reinforcing bars cut from heavy gage steel plate contribute to the overall weight of the complete die equipment. Dimensions of the part were held to a tolerance of −0+⅜ in., and the stamping was made with the metal hot.

LEFT

FIG. 1 — Only 0.001-in. thick, this aluminum foil shim represents one extreme of the range of presswork.

o o o

RIGHT

FIG. 2 — The other extreme is shown by this heavy steel stamping 3½-in. thick and weighing 4300 lb.

Practical Tool Room Heat Treatment

OF the three main steps generally practiced in the hardening of any tool steel, the heating to hardening temperature, the quench, and the draw, the most important is probably the intermediate step of quenching. The main function of quenching hardenable tool steel in the conventional manner is to develop the maximum hardness which the steel in question is able to deliver. It may be said that quenching is important for two main reasons. First, success in obtaining full hardness, assuming that the correct grade of steel has been used for the size of tool with which one is dealing, is dependent on the efficiency of the quenching operation. The second reason why the quenching operation is so important is that nearly all troubles arising from cracking or warping of the tool during the hardening treatment may be traced back to mistakes made during the quenching operation.

The first and second parts of this four-part article, published June 6 and June 13, 1946, were devoted to the classification of tool steels, the principles of heat treatment, decarburization, and the use of furnace atmospheres. In a subsequent and concluding issue the author will describe the use of salt baths in isothermal heat treatment.

The choice of a quenching medium is primarily dependent on the type of steel used and the section of metal with which one is dealing. In the case of carbon tool steels, it is necessary in nearly all cases to use a water quench or a water quench which is further accelerated in its quenching rate by the addition of salt to furnish a brine possessing the power to quench more evenly than water when scale is present on the work. When dealing with an oil hardening steel and some of the air hardening steels, it is necessary to use an oil quench, in which case one should select either a fatty animal oil or a mineral type oil. The first type is particularly suited to the quenching of tools which possess a coating of scale. However, the use of the fatty type quenching oil is not particularly desirable when there is any danger of mixing water with the oil as in the case of an interrupted water-oil quench, nor is it particularly desirable when quenching from molten salt baths into oil. In the first case, water tends in time to emulsify the oil which may result in spotty hardness, and in the second case, the salt may tend to saponify the oil and progressively decrease its quenching efficiency. The mineral type quenching oil does not possess these disadvantages to the same degree and, while affording the same quenching speed as the fatty type animal oil, it is not affected by the introduction of a molten salt into the bath.

Practically all the air hardening steels can be satisfactorily quenched by being allowed to cool in air; however, sometimes when the section of steel is particularly large, it is necessary to quench in a stream of dry air.

In addition to the above common types of quenching media, there is also the molten liquid salt bath type. This may be used in special cases where difficulty has been encountered in hardening a tool without the accompaniment of cracking. The general practices and advantages common to salt bath quenching will be dealt with in the section entitled "Isothermal Heat Treatment."

The general technique of quenching in oil or water is probably well known to the average heat treater. It is necessary that the water or oil bath be of sufficient volume to handle the quantity of work being quenched at any one time without the danger of too great a rise of bath temperature occurring. The temperature of the bath should not be below 50°F; and as a rule should not be allowed to rise above 100°F, particularly in the case of a water quench. The main reason for staying above 50°F is to insure that from one heat treatment to another the same quenching conditions exist in regard to the quenching speed of the bath.

It is advantageous, if possible, to use a quenching bath which is equipped with some means of forced circulation to insure against local heating of any section of the bath which is being used during a quenching operation. It is often necessary to utilize special fixtures immersed in the bath so that the quenching medium can be directed under pressure against the surfaces on which it is important or desirable to obtain full hardness. The type of pressure quenching fixture used will, of course, vary with the job in question.

Speaking in a metallurgical sense, the main function of any quench is to drop the temperature of the steel past the nose of the S-curve so that the steel is maintained in the austenitic condition past this

TABLE V

Approximate Time to Reach Drawing Temperatures[1]

Hot air oven, without forced circulation

Drawing Temp. °F	Approximate Shape of Tool[2]: Cubes or Spheres	Long Squares or Cylinders	Average Flat Tools
300	30	50	90
400	25 min per in.	45 min per in.	65 min per in.
500	25 of	40 of	60 of
700	20 thickness	35 thickness	50 thickness
900	20	30	40

Circulating air oven, or an oil bath[3]

Drawing Temp. °F	Approximate Shape of Tool[2]: Cubes or Spheres	Long Squares or Cylinders	Average Flat Tools
300	15	20	30
400	15 min per in.	20 min per in.	30 min per in.
500	15 of	20 of	30 of
700	15 thickness	20 thickness	30 thickness
900	15	20	30

Note: The above figures apply to a dark or scaled surface on the tool. If the tool surface is finish ground, or otherwise brightened, allow double time in a still hot air oven. No extra allowance need be made for bright surfaces in a circulating oven, or in an oil bath.

[1] Data from Carpenter Service Bulletin, Vol. 2, No. 9.

[2] A form tool 3 in. diam by about 3 in. long would be "like a sphere." Since it measures 3 in. thick, it would require about 75 min to reach 400°F in a hot air drawing oven without forced circulation. A reamer would be "like a long cylinder"; and a blanking die measuring 4 in. x 1½ in. x 8 in. would be an "average flat."

[3] Oil baths should not be used above about 400°F.

The practice of quenching tool steels, which plays an interesting and vital role in view of its importance in determining the physical properties of the finished product, and also due to the precautions that must be observed to avoid warping and cracking, is covered in this article. Tempering, important from the standpoint that it is the controlling factor in obtaining hardness or hardness and toughness, is also discussed.

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critical point. In the case of plain high-carbon steel this means dropping the temperature of the steel down below 1000°F within approximately 3 sec. In the case of oil hardening steels it will mean dropping the temperature of the steel below 1100°F in not less than 8 sec., and in the case of air hardening steels, it will mean dropping the temperature of the steel below about 1200°F in about 15 min. After this nose of the S-curve has been passed, the steel, to all intents and purposes, may be allowed to cool in air and the full hardening value of the steel will be realized.

Since the most dangerous point in the cooling of a quenched piece occurs when transformation takes place, it is particularly important that attention be paid to the treatment to and through this transformation. In the case of most steels when quenched at their critical rate, this transformation, which we may also term the mechanism of hardening, will begin in the range of 500° to 400°F and will continue down to a little below 200°F. It is desirable that the speed with which the steel passes through this transformation range be as slow as possible in order to allow the particularly heavy strains which occur due to this transformation to be dissipated as easily as possible. More will be said on this subject in the section on "Isothermal Heat Treatment."

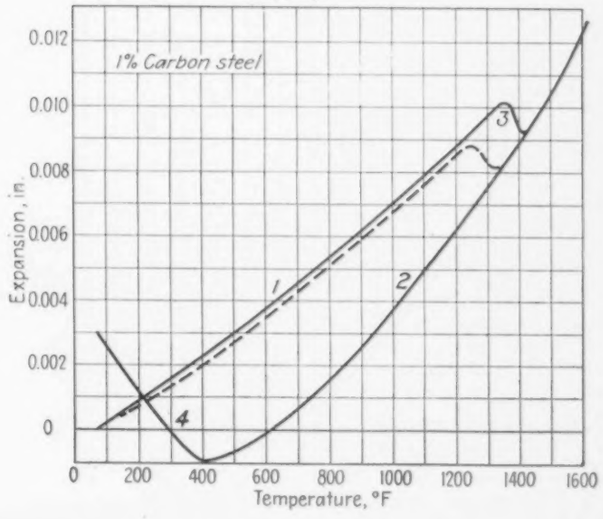
To illustrate more clearly what takes place during the quenching of a hardenable steel, there is reproduced in Fig. 5 the dilation curve of a carbon tool steel during heating and slow and fast cooling to and from the hardening temperature.

When the steel is heated and slowly cooled in the furnace from a temperature above its critical point, it behaves as shown in the solid line (1-3, heating) and the dotted line (cooling). While the steel is still above the critical, it is capable of hardening or softening—depending upon whether the operator chooses to cool it slowly, or quench it rapidly. If he cools it slowly, the critical transformation will occur at about 1300°F (dotted line) and the steel will be annealed—regardless of how fast or how slowly it may be cooled from about 1250°F down to room temperature. If, however, the operator decides to quench the piece, it speeds past 1300°F (2-4, solid line) so rapidly that the critical transformation has no chance to occur. If he were to interrupt the quench on this particular steel at 1200°F—or even 900°F—the delayed critical changes would then take place at this lowered temperature. However, if he quenches it down to 500°F and removes it from the quench, the piece is now so rigid that the critical changes can no longer take place. The steel has not yet hardened—but it has "made up its mind to harden." Upon further cooling below 500°F the actual hardening begins and is completed in the neighborhood of 200°F.

The actual hardening caused by the formation of martensite is acompanied by a dilation or, in other words, an expansion which is clearly illustrated by the upswing at the bottom (curve 2-4) as the steel cools from 400°F to 100°F during quenching.

The steel is in a very interesting "intermediate" condition when its quench has been interrupted at about 500°F. It has not yet hardened—so that, if in the form of a tool, it can be bent with a hammer—and even straightened if it has warped or become crooked. Since the steel has definitely made up its mind to harden, it will do so—even though it might be held at 500°F for a considerable time and then cooled slowly. There was a time when it was considered sound practice to snatch a water-hardening tool steel from the water when it got down to about 400° to 600°F and transfer it to oil to complete the quench. Practical experience, however, has shown that this is very difficult to accomplish. For one thing, the outside of the total is bound to be colder than the inside and unless the tool is very small and of uniform shape, it is difficult to remove it from the quench at a time when all of the sections of the tool are within this narrow temperature range. Practical experience also shows that if the hardener misses this narrow

FIG. 5—Dilation of a 1 pct carbon steel on heating and quenching (full lines) and on slow cooling (dotted lines) (Gill).



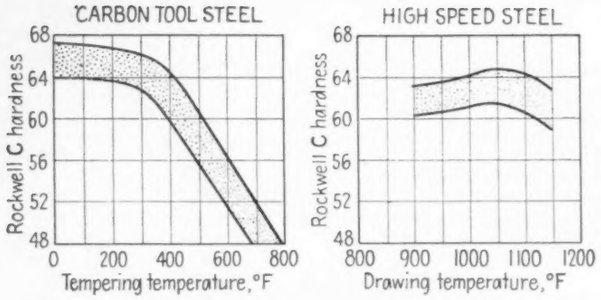


FIG. 6—Effect of tempering temperatures on carbon and high-speed tool steels (SAE 1943 Handbook).

range, he does the steel more harm than good.

We have just stated that most of the transformation will take place in and around the 500° to 200°F temperature range and, knowing that this transformation is attended by considerable expansion due to the formation of martensite, it is important that the transformation through the whole mass or section of the tool be carried to completion. There is always the danger that the tool will be removed from the quench while it is "smoking hot"—which is sometimes the practice when an oil quench is used and, in all probability, only 50 pct of the austenite or hardenable constituent will be transformed to martensite at this time. Should this tool be introduced into a draw furnace at 350°F or more, there will still be austenite present which will not as yet have transformed and which will not transform until after the tool has been removed from the draw furnace, at which time transformation to martensite of this austenite (which has remained untransformed during the first quench) will take place. The final result will be a steel which is percentage-wise only partly drawn, and yet which still contains a percentage of primary hardening constituent, martensite, which has been formed during cooling from the draw. Tools treated in this manner stand a good chance of cracking in service if they do not do so during or shortly after the draw.

There has always been a certain amount of doubt concerning the correct temperature at which the work should be removed from the quenching bath, some heat treaters claiming that the work should be removed while still warm. However, the conception of what warm means may vary appreciably. As pointed out in the above discussion, it is absolutely necessary that the work be quenched and held in the quenching medium until it has passed completely through the dangerous or, should we say, critical 500° to 200°F range. In order to insure that it has passed through this range, no tool should be removed from the quench bath until it has reached the temperature at which it may just be handled with the bare hand. This places the maximum temperature for removal from the quench at about 120°F. With some tools, depending on the grade of steel used and the sections involved, it is safe to leave the tool in the quench bath until it has reached the temperature of the bath without running the risk of cracking the tool. This can only be safely established by actual experience with any specific job.

It is important that the temperature of the quenching media, whether it be brine, water or oil, be held within certain definite ranges and above certain minimum temperatures. In the case of a water or brine quench it is desirable to maintain the temperature of the bath between 70° and 90°F. If the upper temperature is exceeded when quenching water-hardening steels, there is danger that soft spots may develop due to the formation of a steam envelope on the surface of the part being quenched. If the temperature of the bath is much below 70°F, there is danger that with some tools or dies cracking may result because the quenching speed is higher than is necessary. If a brine quench is used, a bath temperature of as high as 100°F may be used without danger of incurring spotty hardness.

Most of the commercial quenching oils have a fairly broad range of temperature through which they maintain a constant and efficient quenching speed. This temperature range generally runs from 60° to 140°F. If it is at all possible to govern the temperature of the oil bath and if the volume is sufficient to guard against appreciable temperature rise during a quenching operation, a temperature of 80° to 120°F is considered to be ideal. This guards against the possibility of not quenching the work outright if the practice is to leave the work in the bath until it has reached the bath temperature as suggested above. Keeping the temperature above 80°F insures against sluggishness of the oil and guarantees good coverage of the surface of the work during the quenching operation and thus makes for even and efficient quenching.

Having completed a quenching operation, which means insuring that the work has cooled to a temperature not exceeding that at which it can just be handled with bare hands, it is important that the work be immediately introduced into the draw furnace if a drawing operation is required. As stated before, most of the cracking which is encountered in the heat treating of tool steels occurs during the quenching operation and no small part of it is due to laxity in observing the simple rule which requires that a steel once quenched must be immediately drawn to minimize the possibility of cracking. When planning to carry out a heat treatment cycle, it is important that provision be made to draw the work or, in other words, to carry out the full cycle of the heat treatment in one continuous operation. This means completing the drawing of the tool or die during the same day in which it is hardened.

The mechanics of quenching air-hardening steels in air are not particularly complex. In the case of the smaller sections using air hardening-types of steel, it is generally sufficient to set the tool or part being treated on a wire grating which will allow uniform cooling of the work. In other cases where the section is large, or where a low alloy air-hardening steel is used, it is necessary that the work be cooled or, in other words, air quenched in a blast of dry air. It is important that there be no free moisture in the air stream, since there will be very possible danger of cracking due to uneven cooling if free water is present in the air stream. By the same token it is indicated that all surfaces of the work should be freely exposed to the air blast so that even cooling is insured.

Tempering

The quenching of tool steels, which is designed to develop hardness, is always accompanied by the introduction of a large amount of stress into the steel. Formation of this stress is due to the contraction of the steel on cooling and also in part by the large temperature gradient which usually exists between the surface and the center of the section during ac-

celerated cooling. Considerable stress is also injected into the work due to the transformation of the unstable austenite into the harder constituent martensite, an actoal expansion taking place when this transformation occurs.

It may be seen that the primary function of the tempering operation is to relieve the stresses which are set up by the transformation of austenite to martensite and during the nonuniform cooling of the steel from the hardening temperature to room temperature. This, as we all know, makes for greater toughness in the steel, but unfortunately this increase in toughness results in an accompanying loss of hardness. This first effect of tempering is, of course, desired; however, the accompanying loss of hardness is usually undesirable. In most tempering operations the aim, therefore, is to retain as high a hardness as possible, commensurate with the attainment of sufficient toughening to enable the steel to overcome the brittleness which makes it unusable for service in the as-quenched condition.

The tempering operation itself consists of heating steel to some temperature below the critical temperature and holding at this temperature for sufficient time to allow the desired changes in stress distribution and structure to take place. The time at temperature will vary in commercial practice anywhere from ½ to 3 hr or more, depending on the size of the section being tempered and the type of steel being treated. It is good practice to control the progress of the softening and tempering process by means of temperature rather than time at temperature.

It is most important that very accurate temperature control of the tempering operation be maintained. In general practice, tempering is carried out in a forced circulation air draw furnace, low temperature salt bath, or low temperature oil bath. The range of most oil baths when used for tempering is generally considered to be at a maximum of 500°F, being dependent, of course, on the flash point of the oil used in the bath. Most air draw furnaces and molten salt baths are capable of tempering within a temperature range of 300° to 1300°F.

It is important that the work be maintained at the tempering temperature long enough to insure uniform heating throughout its whole section. For this reason it is important that sufficient time be allowed for the steel to reach the temperature of the heating media. Table V gives the time necessary to reach the drawing temperature, as regulated by the shape or type of cross-section which is to be treated. These figures deal with heating in a hot air oven, circulating hot air oven, or oil bath. The rate of heating of a molten salt bath may be considered to be about 50 pct faster than that of an oil bath, due to the greater density of the molten salt heating medium.

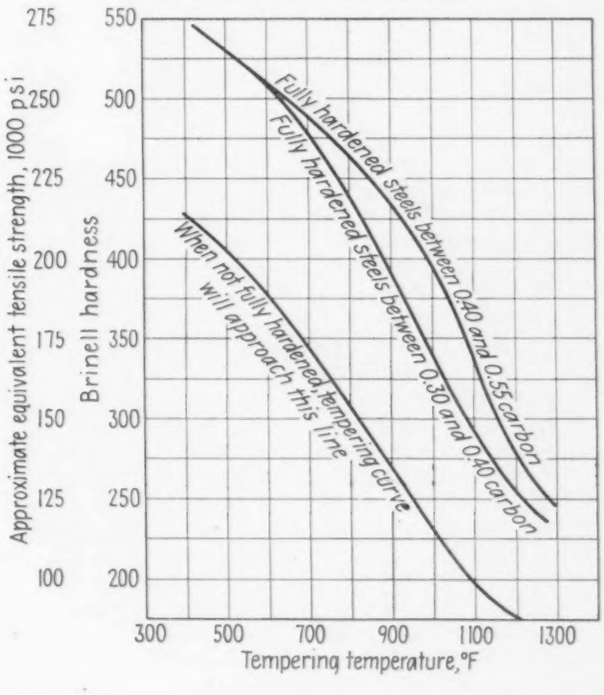
Tempering by color is an old practice still used by many heat treaters. Sometimes this is used due to the lack of proper temperature control equipment and sometimes simply as a check. In using this method, the tempering operation is stopped when a certain color appears on the surface of the steel. The temper colors, of course, are caused by the oxidation of the steel; the higher the temperature the thicker the oxide coating, and hence the series of colors, which are noticed on heating. The accuracy of this method of controlling tempering is very limited, since the rate of heating or the time of holding at temperature will materially influence the amount of oxidation, or in other words, the color which occurs at different temperatures. Then again, certain steels such as plain carbon steels, will oxidize or color more rapidly than many of the steels containing higher amounts of alloy. It is well to emphasize here that accurate temperature control of the tempering heating unit and the use of a sufficiently long time at temperature are the best means of insuring accurate and reproducable results in this important phase in the heat treating of tool steels.

In fig. 6 are shown two graphs showing the effect of the tempering temperature on carbon steels and also on high-speed steel. A rather broad variation of hardness at the different tempering temperatures is shown on these graphs. Such factors as the quenching temperature and minor variations in the chemical analysis of these two types of tool steels will vary the effect which different temperatures will produce.

Fig. 2 (part I, June 6, 1946) illustrates this point in the tempering of 18-4-1 high-speed steel. A study of this chart shows that if the steel is quenched at 2350°F, a temperature of 800° F produces a hardness of 62 Rockwell C, whereas if the steel is quenched from 2000°F, the same tempering temperature produces a Rc hardness of 54. Fig. 7 illustrates the effect of tempering temperature on low and medium carbon steels both in the fully hardened state and the non-fully hardened state.

The section on quenching emphasized the importance of tempering immediately following the quenching operation, in order to guard against the danger of cracking which may be caused by the stresses built up during the quenching operation. Carelessness in following this practice has accounted for a greater number of tool losses by cracking, an experience which every heat treater has had at one time or another. Another point worth repeating here, is the importance of insuring that the steel, in quenching, has cooled to

FIG. 7—Effect of tempering temperature on the hardness of low and medium carbon steels in the fully and partially hardened state (SAE 1943 Handbook).



the point at which it may be handled with the bare hands before being introduced into the tempering furnace. If the steel is placed in the tempering furnace while it is still above 300° F, it is often the case that transformation has not been completed and a certain percentage of retained austenite will remain. This austenite will remain untransformed to martensite until after the tool has been cooled to room temperature following the tempering operation, at which time the formation of martensite taking place will leave the steel with a fair percentage of stresses of the same nature as those which are produced during the initial quenching operation. It is for this reason that in treating the high-speed types of steel a double draw is generally practiced, since it is almost impossible to initially eliminate retained austenite no matter how carefully the steel is quenched, and for this reason, martensite will be formed on cooling from the first draw. The purpose of the second draw is then to temper the martensite formed from the austenite remaining in the steel on cooling from the first draw. This practice insures maximum toughness in high-speed steels commensurate with the hardness which is aimed at.

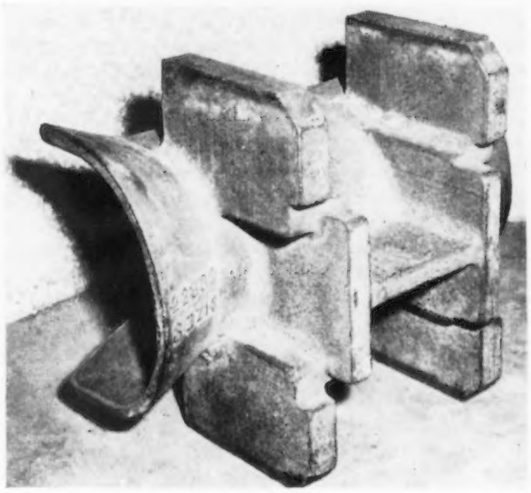
Nickel Electrode for Cast Iron Welds

ELIMINATION of virtually all of the difficulties inherent in the welding of cast iron is claimed for a new type electrode recently announced by International Nickel Co. Known as Ni-Rod, this electrode is said to produce a stable arc in all positions, and to give a deposit that washes up evenly against the sides of the joint. It does not undercut or leave narrow grooves to trap flakes of slag that would weaken the weld as subsequent passes are made, and this, in combination with the chemical nature of the flux itself, makes it very easy to remove the slag from the bead.

The weld metal is both strong and machinable, and being of nickel, is actually stronger than the cast-iron parent metal. Fusion of the deposit and the parent metal is so thorough that it is virtually impossible to knock loose a Ni-Rod weld or overlay. Preheating is usually necessary only when a very high degree of machinability is desired, or when the structure and shape of the casting are likely to develop high internal stresses during the heating and cooling cycles caused by the arc.

The largest field for the use of this new electrode is general repair and maintenance of cast iron parts and equipment, including welding cracked and broken castings, and building up worn surfaces such as wheels and die faces. Here the strength and soundness of the deposit is useful; machinability also may be a desirable quality in these cases, as when a casting has cracked or broken in one of its operating surfaces or across threaded holes. A second large field for this rod is in remedying minor flaws in new castings. Filling a blow hole or building up an undersize area is said to be a simple job, and when the spot has been finished by grinding or machining, the close color match between the deposit and the cast iron makes it almost impossible to see where the weld has been made.

Besides being useful in these two fields, the rod has been used for such production jobs as welding steel bars to a casting. Chipping the casting face, drilling and tapping are thus eliminated, and the nickel deposit produces an excellent bond between the steel and the cast iron. Ni-Rod can also be used to erase machining errors on new castings. If a cut is too deep or too long, or in the wrong place, it can be filled with an easily-machined deposit, and begun all over again.



The accompanying illustration shows a guide barrel used in a tube mill. Due to a pattern error the casting was made ¼ in. short on each of the guides. These were built up by 10 passes of 5/32 in. dia rod, and readily machined to final size. Approximately 9 lb of rod was used, and no preheat was required.

Combination Soldering Iron and Blow Torch

DEVELOPED in Germany during the war, a combination gasoline blow torch and soldering iron has recently been examined by the Engineer Board, Army Service Forces, Fort Belvoir, Va.

The burner head of the tool is of common design, and the fuel tank forms the handle of the torch. The pump is inside the tank. The soldering copper is fastened to the top of the torch and is held in the torch flame, the heat from which is concentrated on the copper by a sheet metal guard. In soldering, the bulk of the burner is a slight handicap, but the tool is well balanced, and is described as a practical dual purpose tool.

Without the soldering attachment, the tool becomes a good blow torch with a fuel capacity of ½ pt. It is light in weight and easy to handle, and the degree of heat may be controlled by a valve.

When electricity is not available, it is common practice to employ two soldering irons, one for heating while the other is in use. The German tool has the advantage of eliminating the extra iron by permitting continuous application of heat to the copper.

Welding With Powdered Metal

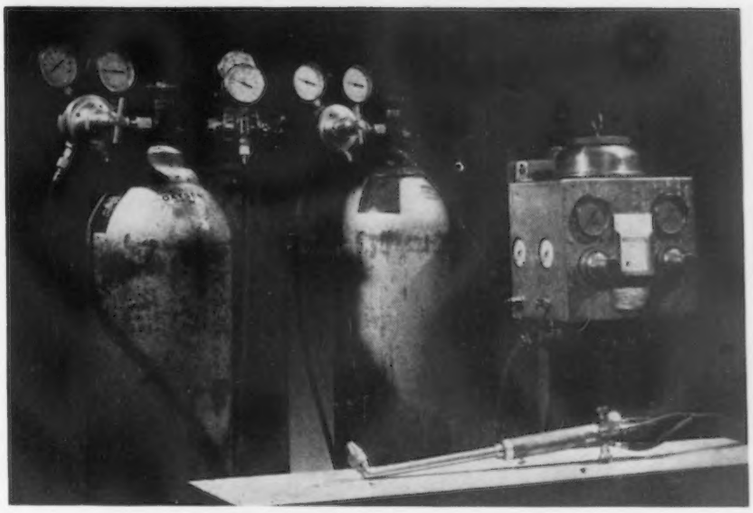


FIG. 1—Equipment necessary for Powder Welding consists of a special torch, and a control box which also houses the powdered metal supply. A source of processing gas is required in addition to the usual fuel and air.

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REPLACEMENT of the conventional welding rod by a spray of powdered metal is the basis of a newly developed welding technique announced by Powder Weld Co., 419 Kent Ave., Brooklyn. Said to be entirely different from any other welding method, the system opens up new fields in welding and metal or plastic surfacing. The equipment, shown in fig. 1, consists of a torch made in the general form of an ordinary welding torch, but having a special nozzle and 16 independent controls, many of them at the handle of the tool; a control box with air and gas pressure regulating valves, and a canister from which powdered materials are fed through the flame. The flame is generated and controlled by preselected combinations of gases and air.

The use of this system is somewhat restricted at the present time, due to the fact that there are not many powdered metals available suitable to such use. The same limitation applies also to a certain extent to fluxes. But with such materials as are available, as well as with some which were specially prepared for experimental use, very interesting results have been achieved in welding, brazing, hard surfacing and plastic surfacing. Among the materials used are lead, tin, zinc, cadmium, aluminum, copper, iron, magnesium, manganese, nickel, silver, and alloys of these metals containing beryllium, bismuth, carbon, cobalt, molybdenum and tungsten. In addition, various metallic oxides and plastic compositions have been used, as well as glass forming compounds which result in enamels and glazed coatings.

In actual use, the required material is thoroughly mixed with a predetermined amount of flux and placed in the canister of the control box. Gas pressure feeds this through the torch tip and the amount may be precisely regulated by one of the valves on the torch handle as shown in fig. 2. This permits control of the amount of mixture used per minute or per inch of weld. Flame temperature is similarly controlled by adjusting the fuel gas-air mixture as in a conventional torch, by means of valves in the handle. A fourth control in the handle permits regulation of the cooling or processing gas which surrounds the flame cone and forms a controlled atmosphere. By proper regulation of these controls it is possible to regulate the temperature of the alloy, plastic, or other material projected, as well as the temperature of the workpiece. Since both workpiece and material temperatures are controlled by the operator, a variety of results are possible from high quality bonded hard surfacing, welding, and brazing to dry application of metal similar to ordinary metal spraying.

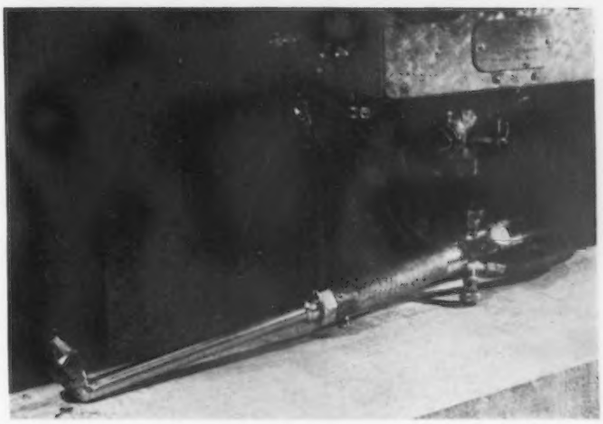


FIG. 2—The special torch used for Powder Welding incorporates controls for the welding and process gases and for the supply of powdered metal and flux.

If desired, the Powder Weld torch may be used for welding or brazing with conventional rod or wire, but eliminating separate flux application. The flux may be deposited in powdered form through the flame at exactly the desired point and in exactly the required quantity. The flux must be used dry, thereby eliminating liquids that might cause oxidation.

The lack of commercially available powdered metals, particularly alloys, has tended to restrict the application of Powder Weld to hard facing operations, and considerable success has been achieved with certain alloys that are so hard that no practical method had previously been available for their application. It is expected, however, that as other metals are made available the method will spread into increasingly wider use, particularly since there are no restrictions as to welding positions. The fact that the weld metal and flux are supplied under pressure eliminates the necessity for confining the process to downhand welding.

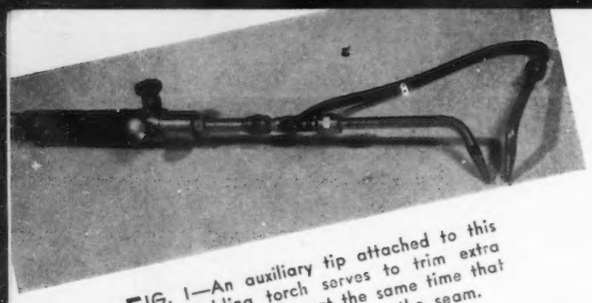


FIG. 1—An auxiliary tip attached to this gas welding torch serves to trim extra metal from a flange at the same time that the regular tip is welding the seam.

Multiple Tip Torches

By WILLIAM P. BROTHERTON
Ryan Aeronautical Co.
San Diego

SPECIALIZING in the welding of stainless steel, Ryan Aeronautical Co., one of the world's outstanding producers of aircraft and aircraft exhaust systems, has devised a number of interesting new techniques and devices which may have valuable significance to other manufacturers who are engaged in the production welding of similar material.

One of these devices is illustrated in fig. 1, and is a new type of oxyacetylene welding torch equipped with two tips. This torch steps up the production of exhaust systems by performing two operations simultaneously; trimming the extra flange metal and welding the seam. Previously, it was necessary to trim this flange with a "jitterbug" cutter and then spot tack the sections together prior to seam welding.

The tips of the torch direct the heat against opposite sides of the flange as shown in fig. 2. The outside tip has a smaller diameter because it is the preheating tip. It preheats the metal and permits the welding speed to be raised from 2½ to 7½ ipm. One adjustment takes care of both flames, and the increased tempera-

FIG. 2—The double tip torch in action. The secondary tip also serves to preheat the metal and permits welding speed to be increased from 2½ to 7½ ipm.

RIGHT

FIG. 3—Natural gas attachment applied to a standard welding torch serves to preheat and postheat the weld. This permits the use of high welding speeds and eliminates the danger of weld cracking.

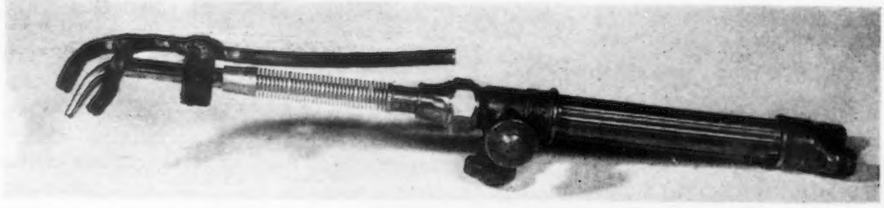
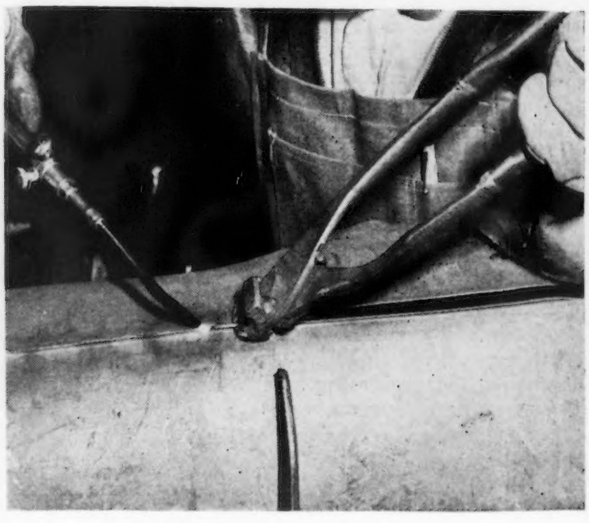


FIG. 5—Special tacking pliers serve to aline the edges of a flange for tack welding.

BELOW

FIG. 4—Burning natural gas inside tubular sections, after one end has been plugged with asbestos, serves to consume the oxygen and prevents oxidation of the inside of the seam.



Speed Stainless Steel Welding

Among the many wartime developments at Ryan Aeronautical Co., are multiple tip gas welding torches that perform welding and cutting operations simultaneously, and improve weld quality on stainless steel. These torches are described herein, together with special welding pliers and clamps, lightweight atomic hydrogen torches, automatic welders, and other devices developed by the company for increasing welding speed and quality.

ture derived from two tips both strips the flange from the assembly and welds the remaining seam.

Another welding torch, shown in fig. 3, has three flame tips; a special pair of natural gas tips in addition to its oxyacetylene tip. The natural gas is burned ahead of and behind the welding tip to provide preheating and postheating of the stainless steel. Natural gas flows ahead of the weld zone to preheat the metal and escapes through tip perforations to maintain weld area temperature after the weld is made. This postheating is done so that the material will not cool too rapidly behind the weld and cause cracking.

Stainless steel has a high coefficient of expansion, twice that of mild steel, and therefore it is particularly subject to distortion. The effect of too abrupt a heating before, and cooling after, the weld causes a scissors-like stress which cracks the metal. The greater the welding rate, the more pronounced is this effect. Yet, rapid welding of stainless steel is very desirable because it reduces the loss of corrosion resistance of the steel. With this new torch, welding speed can be increased to 6 ipm with excellent results. Another advantageous feature of this torch is the prevention of oxidation of the metal by the flow of postheating gas which protects it from the air.

In order to prevent oxidation of the internal weld seam in long closed sections, a novel technique is utilized. Natural gas is introduced into one end of the structure and the other end is sealed with wet asbestos as illustrated in fig. 4. As the gas burns within the tube it reduces the atmosphere and effectively prevents the oxidation of the weld area by consuming the available oxygen.

Two valuable tools which Ryan designed to simplify the welding job are the tacking pliers, fig. 5, and ad-

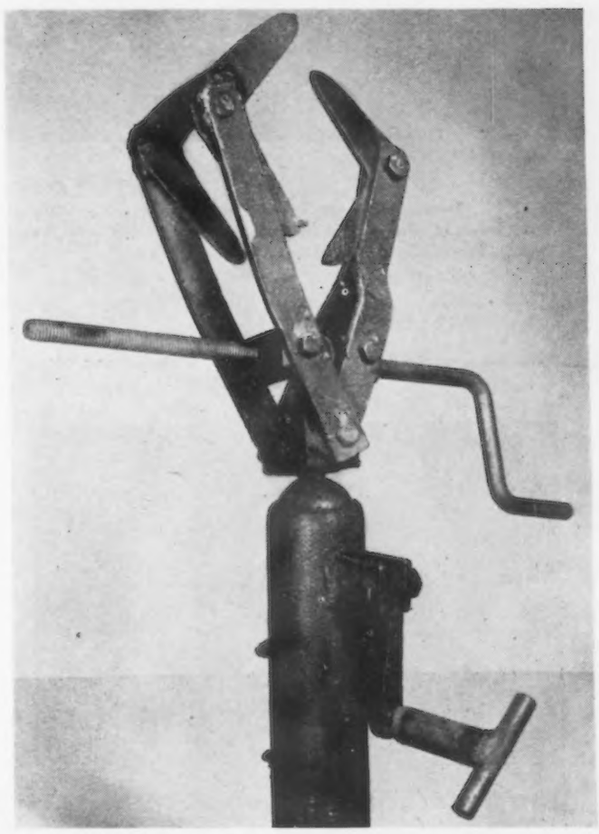


FIG. 6—Ball-mounted welding clamp which simplifies the holding of round or irregularly shaped workpieces during welding.

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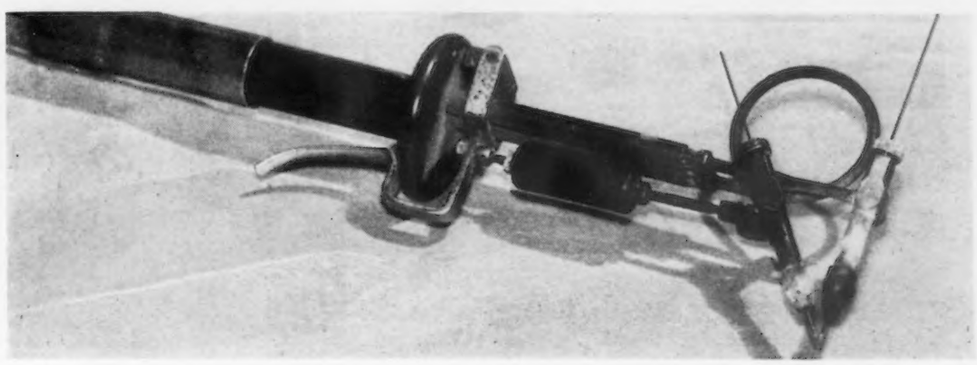

FIG. 7 — Light weight atomic hydrogen welding torch specially designed for use by women welders. Its weight is less than half that of standard torches.

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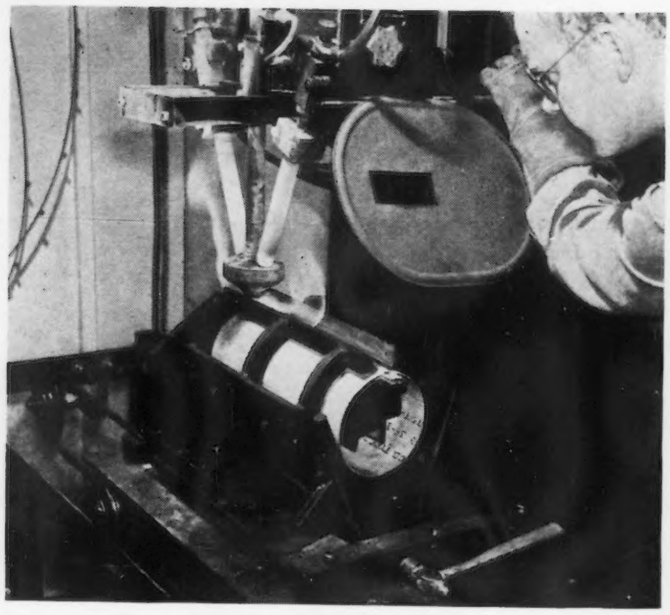

ABOVE

FIG. 8—Automatic conveyor and fixture which greatly accelerates the atomic hydrogen welding of straight tubular sections of stainless steel.

BELOW

FIG. 9—Spot tacking prior to seam welding eliminates the use of cumbersome clamps, and has been one of the major factors in making possible the quantity production of exhaust manifolds.

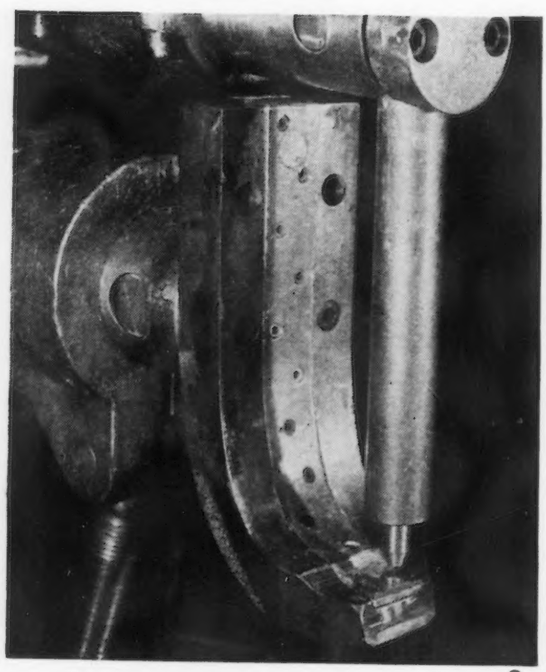

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FIG. 10—Heat treated steel electrode with built-in copper conductor serves to facilitate spot welding in otherwise inaccessible structures.

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BELOW

FIG. 11—Spot welding an oddly shaped assembly is made possible by the use of a specially formed electrode.

justable clamp, fig. 6. These pliers are used to align and hold the edges of a flange for tack welding. The faces of the pliers are ground and hard-surfaced with Stellite. In addition to the claws, there is a metal finger which extends down between the flange edges and alines them evenly for spot tacking. Gas tacking, instead of spotweld tacking is used on exhaust manifolds because of their large and complex shape. The clamp, snugly holding the steel section, is an adjustable model which fits any diameter. It extends down to a special ball and socket swivel for positioning in any plane.

The Ryan Aeronautical Co. installed atomic hydrogen welding equipment in 1939. This process had proved itself valuable in many ways in other industries but little information was available upon its use with the light-gage stainless steels of aviation. Ryan designed light-weight electrode holders, fig. 7, weighing half as much as the standard holders supplied with the equipment. These torches made it possible for large numbers of women to be used in the atomic welding program.

Atomic hydrogen is one of the cleanest and fastest methods for joining stainless steel. It adds no undesirable carbon to the welded metal and costs about one half as much per foot of weld seam as oxyacetylene gas. It derives its speed from the extra heat obtained from the molecular change of the hydrogen gas which is added to that generated by the arc stream. The hydrogen absorbs energy as it passes through the arc and changes from molecular to atomic in structure. Upon striking the metal, it is transformed back into its molecular form, releasing large quantities of heat. In addition to increased speed and reduced costs, atomic hydrogen produces a more ductile weld with superior microstructure. It lends itself nicely to the design requirements of the exhaust manifold industry.

The technique of burning gas inside long tubular sections, illustrated in fig. 4, is also employed in atomic arc welding. This prevents oxidation of the interior weld seam and eliminates the problem of applying flux to inaccessible areas.

To attain top speed in the welding of tubular sections of stainless steel with atomic hydrogen, Ryan designed and built the automatic conveyor machine, shown in fig. 8, which makes possible fast, smooth, automatic atomic welding at the rate of 28 ipm. This rate forms a striking comparison with the oxyacetylene rate of 5 ipm or the 10 to 12 in. for metallic arc welding.

One of the greatest aids in taking the manufacture of exhaust manifolds from a hand method to a mass production system, was the development of the use of rapid spot-tacking for the assembly of stainless steel half stampings. Before this innovation, the half stampings were taken from the drop hammers, thoroughly cleaned. and assembled with clamps for seam welding.

FIG. 12—Special tong-type spot welder with mechanically operated pressure device. Extra-long electrode arms reach into remote areas.

The parts had to be very carefully held together in the clamps so that the edges would fit correctly for the seam welding.

With the new technique, the half stampings are quickly spot tack welded together, as shown in fig. 9, without the need for adjusting holding clamps. The operator holds the parts in alignment while as many as 120 spots per min are located to stitch the parts together prior to the seam welding.

Many unusually shaped electrodes are used to spotweld odd or hard-to-reach assemblies, such as that shown in fig. 10. This electrode is fabricated from heat-treated steel, with high strength to prevent deflection, and a copper insert for good conductivity. It was developed to permit the spotwelding of an extremely inaccessible structure by insertion into a narrow opening, as illustrated in fig. 11. The upper electrode is water cooled.

A tong-type spot welder, which has a mechanically operated pressure device has been very useful in the spot tacking of an engine cowl. Fig. 12. Pressure is exerted by a lever arrangement. This tool has a solenoid switch control for timing the discharge of current and extra long electrodes for reaching remote areas.

Drawing Four-Sided Wire

THE drawing of four-sided wire by means of hard metal drawing dies was formerly not possible because the hard metal inserts in the drawing die, effecting the drawing, fractured at the sharp angles as a result of the exacting edge stresses set up. These difficulties have now, however, been by-passed by using hard metal inserts made up of four separate parts, according to a report in *Stahl und Eisen*, vol. 62, 1942, p. 1090. The stresses in the four similar hard metal plates, which butt together in the corners of the drawing die, are so small as not to be dangerous.

ASTM 49th ANNUAL MEETING

AN intensive program including technical sessions, committee meetings and report presentations, industrial plant trips, non-commercial displays, a photographic exhibit, and an exhibit of testing apparatus and related equipment, has been planned for the 49th annual meeting of the American Society for Testing Materials, to be held in Buffalo, June 24 to 28, 1946.

A total of 24 technical sessions have been arranged for the presentation of about 150 technical papers and reports, a majority of which have been correlated into symposiums on (1) bearings, (2) fatigue of materials, (3) testing of parts and assemblies, (4) oil procurement practices, (5) effect of temperature on the properties of metals, (6) pH measurement, (7) atmospheric resistance of stainless steels, and (8) freezing and thawing tests for concrete.

The technical program will be highlighted by the 20th Edgar Marburg Lecture, which will be delivered by Dr. J. J. Mattiello, vice-president and technical director of the Hilo Varnish Corp., Brooklyn, entitled "Protective Organic Coatings as Engineering Materials."

The 19th award of the Charles B. Dudley (first president of ASTM) Medal will be made to H. R. Copson, research chemist, The International Nickel Co., Bayonne, N. J., for his paper on "A Theory of the Mechanism of Rusting of Low Alloy Steels in the Atmosphere" (published in the 1945 Proceedings). Also, R. C. Brumfield, Instructor in Mechanical Engineering, California Institute of Technology, Pasadena, Calif., will be announced as the recipient of the Richard L. Templin Award (established in 1945 as a prize award for papers describing new testing methods and apparatus) for his paper on "A Sulfur Print Method for the Study of Crack Growth in the Corrosion-Fatigue Metals" (published in the 1945 Proceedings). In view of Mr. Brumfield's inability to attend the annual meeting, the actual presentation will be made in California at a later date.

At the annual dinner, to be held June 26, the retiring president, John R. Townsend, Bell Telephone Laboratories, will give his president's address, "The Challenge of National and International Affairs to the Engineer." The guest speaker, Dr. B. K. Sandwell, editor of the Canadian publication *Saturday Night*, will speak on the subject "A Testing Time for Canada."

A letter ballot is now in process for the election of a new president, vice-president, and five members of the board of directors. The official nominees for the above positions are: For president—Arthur W. Carpenter, manager of testing laboratories, The B. F. Goodrich Co., Akron; for vice-president—R. L. Templin, assistant director of research and chief engineer of tests, Aluminum Co. of America, New Kensington, Pa.; for the board—A. G. Ashcroft, director of research, Alexander Smith & Sons Carpet Co., Yonkers, N. Y.; A. T. Chameroy, manager of merchandise testing and development laboratory, Sears Roebuck & Co., Chicago; J. H. Foote, supervising engineer, The Commonwealth and Southern Corp., Jackson, Mich.; F. E. Richart, research professor of engineering materials, University of Illinois, Urbana, Ill.; L. H. Winkler, metallurgical engineer, Bethlehem Steel Co., Inc., Bethlehem, Pa. The new officers will be introduced during the annual dinner.

The Seventh Exhibit of Testing Apparatus and Related Equipment, to be on display in the exhibition hall (17th floor of the Statler Hotel), will feature a large number of new instruments and laboratory equipment as well as improved versions of the older lines.

Photography, radiography and photomicrography will receive special attention at the Fifth ASTM Photographic Exhibition and Competition, the theme of which is "Materials, Testing and Research."

Technical Program of Annual ASTM Meeting

ALL technical sessions will be held at the Hotel Statler in either the Chinese Room (mezzanine), the Ballroom (main floor) or the Assembly Room (17th floor). The condensed technical program below is limited to those sessions of interest to the metalworking trade. All times indicated are Eastern Daylight Saving Time.

Monday, June 24

8:00 P. M.

Symposium on Bearings—1st Session

"Life Testing of Plain Bearings for Automotive Engines," by E. T. Johnson, Chrysler Corp.

"Fatigue Testing Machines for Ball and Roller Bearings," by Thomas Barish, Consulting Engineer.

"Metallographic Observations of Ball Bearing Fatigue Phenomena," by A. B. Jones, New Departure Div., General Motors Corp.

"Fatigue Testing of Roller Bearings,"

H. R. Gibbons, Hyatt Bearing Div., General Motors Corp.

"*Testing of Bearings Under Controlled Load*," by J. M. Frankland, Chance Vought Aircraft Div., United Aircraft Corp.

Tuesday, June 25

9:30 A. M.

Symposium on Fatigue—2nd Session
(Simultaneous with 3rd Session)

"*Fatigue Tests of Rail Steel Under Compressive Stress*," by R. S. Jensen and H. F. Moore, University of Illinois.

"*A Study of the Damaging Effect of Fatigue Stressing on X4130 Steel*," by J. A. Bennett, National Bureau of Standards.

"*Fatigue Properties of Several Alloy Steels as a Function of Hardness*," by Henry H. ZurBurg, Chrysler Corp.

"*Fatigue of Wood and Glued Wood Constructions*," by W. C. Lewis, Forest Products Laboratory.

(Continued in 4th Session)

9:30 A. M.

Symposium on Spectroscopic Light Sources—3rd Session
(Simultaneous with 2nd Session)

"*The Present Status of Excitation in Spectrographic Analysis*," by B. F. Scribner, National Bureau of Standards.

"*A Study of the Controlled Spectrographic Spark Source*," by J. H. Enns and R. A. Wolfe, University of Michigan.

(Continued in 5th Session)

2:00 P. M.

Symposium on Fatigue (continued)—4th Session
(Simultaneous with 5th and 6th Session)

"*Fatigue Tests on Some Additional Copper Alloys*," by Alton R. Anderson, Emery F. Swan and Earl W. Palmer, American Brass Co.

"*The Fatigue Properties of Beryllium Copper Strip and Their Relation to Other Physical Properties*," by G. R. Gohn and S. M. Arnold, Bell Telephone Laboratories, Inc.

"*The Fatigue Strength of Some Magnesium Sheet Alloys*," by L. R. Jackson and H. J. Grover, Battelle Memorial Institute.

"*Properties of Several Plastics and an Aluminum Alloy as Obtained from Tests on Four Different Types of Fatigue Machines*," by William N. Findley and Robert L. Sutherland, University of Illinois.

"*The Notch Sensitivity in Fatigue Loading of Some Magnesium-Base and Aluminum-Base Alloys*," by George H. Found, the Dow Chemical Co.

2:00 P. M.

Symposium on Spectroscopic Light Sources (continued)—5th Session
(Simultaneous with 4th and 6th Session)

"*Some Properties of Gas Discharges Used as Spectral Sources*," R. C. Mason, Westinghouse Research Laboratories.

"Short Period Behavior of Spectroscopic Light Sources," by G. H. Dieke, John Hopkins University.

8:00 P. M.

Technical Papers on Methods of Testing—7th Session

"*An Automotive Tire Fatigue Machine*," by J. N. Kenyon, Columbia University.

"*New Design of Elastic Proving Bar*," by C. G. Lutts and Dante Cuozzo, Boston Naval Shipyard.

"*A Study of the Geometry of the Tension-Impact Specimen*," by N. A. Kahn and E. A. Imbembo, U. S. Navy Yard.

"*A Study of the Tension Test*," by Earl R. Parker and Harmer E. Davis, University of California.

"*A Method for Predicting Failure of Metals*," by P. E. Cavanagh, Allen B. DuMont Laboratories, Inc.

"*Brinell Hardness of Gray Cast Iron*," by J. T. MacKenzie, American Cast Iron Pipe Co.

Wednesday, June 26

9:30 A. M.

Symposium on Testing of Parts and Assemblies—8th Session
(Simultaneous with 9th Session)

"*Fatigue Strength of Lap Joints in Magnesium Sheet Alloys*," by H. J. Grover and L. R. Jackson, Battelle Memorial Institute.

"*Fatigue Characteristics of Magnesium Castings*," by G. H. Found, Dow Chemical Co.

"*Endurance—A Criterion of Design*," by W. T. Bean, Continental Aviation and Engineering Corp.

"*Pneumatic Fatigue Machines*," by F. B. Quinlan, General Electric Co.

(Continued in 10th Session)

1:30 P. M.

Symposium on Testing of Parts and Assemblies (continued)—10th Session
(Simultaneous with 11th Session)

"*Automotive Rear Axles and Means of Improving Their Fatigue Resistance*," by Oscar J. Horger and C. Lipson, Timken Roller Bearing Co. and Chrysler Corp., respectively.

"*Stress Concentration vs. the Fatigue Strength of Engine Components*," by Charles W. Gadd, Andrew Zmuda and N. A. Ochiltree, General Motors Corp.

"Investigation of Materials for Marine Propellers," by William C. Stewart, U. S. Navy.

4:30 P. M.

Marburg Lecture—12th Session

Twentieth Edgar Marburg Lecture, "*Protective Organic Coatings as Engineering Materials*," by J. J. Mattiello, Hilo Varnish Corp.

JOHN R. TOWNSEND

Bell Telephone Laboratories, Retiring President ASTM

7:00 P. M.

Annual Dinner

Thursday, June 27

9:30 A. M.

Session on Effect of Temperature on the Properties of Metals—Materials for Gas Turbines — 13th Session
(Simultaneous with 14th Session)

"*Heat-Resisting Metals for Gas Turbine Parts*," by Howard C. Cross and Ward F. Simmons, Battelle Memorial Institute.

"*High-Temperature Alloys Developed for Aircraft Turbosuperchargers and Gas Turbines*," by J. W. Freeman, E. E. Reynolds, and A. E. White, University of Michigan.

"*Chromium-Base Alloys*," by Robert M. Parke and Frederick P. Bens, Climax Molybdenum Co.

"*Application of High-Temperature Alloys to Correct Gas Turbine Designs*," by F. S. Badger, Jr., and W. O. Sweeney, Jr., Haynes-Stellite, Kokomo, Ind.

"*Alloys and Ceramic Materials for High-Temperature Service*," H. C. Cross, Battelle Memorial Institute.

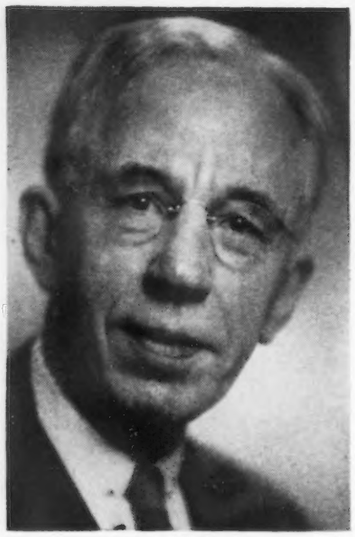
(Continued in 17th Session)

9:30 A. M.

Symposium on pH Measurements—14th Session
(Simultaneous with 13th Session)

"*Historical Review of the Hydrogen Electrode and the Calomel Cell in the Measurement of Hydrogen Ions*," by C. N. Myers.

"*Theoretical Considerations in the*



B. K. SANDWELL

Editor of Canadian Publication Saturday Night

Choice and Definition of the pH Scale," by J. K. Warner, D. S. McKinney and J. P. Fugassi, Carnegie Institute of Technology.

"*Standard Buffer Solutions,*" by G. G. Manov, National Bureau of Standards.

"*Recent Advances in the Theory and Use of Glass Electrodes for pH Determination,*" by M. Dole, Northwestern University.

(Continued in 15th Session)

2:00 P. M.

Symposium on pH Measurements (continued)—15th Session
(Simultaneous with 16th Session)

"*Precautions to Be Observed in Making Colorimetric pH Determinations,*" by F. R. McCrumb, W. A. Taylor & Co.

"*Acid-Base Equilibria in Aqueous and Nonaqueous Solutions,*" by Martin Kilpatrick, University of Pennsylvania.

"*The Potentiometric Estimation of Hydrogen Ion Concentration in Nonaqueous Media,*" by L. Lykken, Shell Development Co.

2:00 P. M.

Presentation of Reports of Committees on Ferrous Metals, Paints and Miscellaneous Subjects—16th Session
(Simultaneous with 15th Session)

8:00 P. M.

Session on Effect of Temperature on the Properties of Metals—General (continued)—17th Session

"*Report of Joint Research Committee on Effect of Temperature on the Properties of Metals,*" by N. L. Mochel, Chairman.

"*The Effect of Carbide Spheroidization Upon the Rupture Strength and Elongation of Carbon-Molybdenum Steels,*" by S. H. Weaver, General Electric Co.

"*Compressive Properties of Aluminum Alloy Sheet at Elevated Temperatures,*" by Alan E. Flanigan, Leslie F. Tedsen and John E. Dorn, University of California.

"*Tensile and Creep Strengths of Some Magnesium-Base Alloys at Elevated Temperatures,*" A. A. Moore and John C. McDonald, Dow Chemical Co.

"*Resistance of Iron-Nickel-Chromium Alloys to Oxidation in Air at 1600 to 2200°F,*" by Oscar E. Harder, Battelle Memorial Institute.

"*Influence of Strain Rate and Temperature on the Mechanical Properties of Monel Metal and Copper,*" by D. J. McAdam, Jr., G. W. Geil and D. H. Woodard, National Bureau of Standards.

8:00 P. M.

Symposium on Atmospheric Weathering of Corrosion-Resistant Steels—18th Session
(Simultaneous with 17th and 19th Sessions)

"*Results of 15-yr Exposure Tests on Corrosion-Resistant Steel,*" by I. V. Williams and K. G. Compton, Bell Telephone Laboratories, Inc.

"*Atmospheric Corrosion Tests on Corrosion-Resistant Steel,*" by G. L. Snair, Jr., Allegheny Ludlum Steel Corp.

"*Atmospheric Corrosion Tests on High-Chromium Steels,*" by W. O. Binder and C. M. Brown, Union Carbide and Carbon Research Laboratories, Inc.

"*Weathering Behavior of Corrosion-Resistant Steel Insect Screens,*" W. A. Wesley and H. R. Copson, The International Nickel Co.

"*Marine Exposure Tests of Corrosion-Resistant Steel Sheet,*" by W. H. Mutchler, National Bureau of Standards.

"*Corrosion-Resistant Steel for Architectural and Structural Applications,*" by H. A. Grove, Republic Steel Corp.

"*Atmospheric Corrosion Tests of Corrosion-Resistant Steel Wires,*" by A. P. Jahn, Bell Telephone Laboratories, Inc.

Friday, June 28

9:30 A. M.

Presentation of Reports of Committees on Cement, Concrete, Lime, Refractories, Masonry Materials—20th Session
(Simultaneous with 21st Session)

9:30 A. M.

Presentation of Reports of Committees on Nonferrous Metals and Miscellaneous Materials—21st Session
(Simultaneous with 20th Session)

2:00 P. M.

Technical Papers on Plastics and Wood—22nd Session
(Simultaneous with 23rd and 24th Sessions)

"*Effect of Weathering on Insulation Resistance of Plastics,*" by Leslie H. Campbell, Arthur H. Falk and Robert Burns, Bell Telephone Laboratories, Inc.

"*Effect of Temperature and Humidity on Mechanical Properties of Molded Cellulose Acetate Plastics,*" by W. E. Welch, R. F. Hayes, T. S. Carswell and H. K. Nason, Monsanto Chemical Co.

"*Methods for Determining the Specific Gravity of Wood and Wood-Base Materials,*" by L. J. Markwardt and B. H. Paul, Forest Products Laboratory.

2:00 P. M.

Technical Papers on Nonferrous Metals—23rd Session
(Simultaneous with 22nd and 24th Session)

"*The Notch Sensitivity in Static and Impact Loading of Some Magnesium Base and Aluminum-Base Alloys,*" by J. P. Doan and J. C. McDonald, Dow Chemical Co.

"*Atmospheric and Indoor Aging Studies on Some Aluminum and Zinc-Base Die Casting Alloys,*" by G. R. Gohn and Lucille E. Menges, Bell Telephone Laboratories, Inc.

"*Evaluation of the Forming Properties in Bending of Five Commercial Sheet Aluminum Alloys,*" by G. R. Gohn and S. M. Arnold, Bell Telephone Laboratories, Inc.

"*Creep Tests on Some Lead and Lead Alloy Sleeves and Tapes,*" by G. R. Gohn, S. M. Arnold, and G. M. Bouton, Bell Telephone Laboratories, Inc.

"*A Permeameter for Metals Used in Cathode Ray and Television Tubes,*" by H. J. Evans, Radio Corp. of America.

"*Compressive Stress—Strain Properties of Aircraft Materials,*" by P. E. Sandorff and R. K. Dillon, Lockheed Aircraft Corp.

Testing Apparatus and Related Equipment

. . The exhibit will be held on the 17th floor of the Statler Hotel. Exhibitors have been urged to stress technical and educational matters in their booth displays and to have capable booth representatives in attendance to discuss technical problems. Following the listing of the commercial exhibitors is a listing of technical committee, non-commercial displays.

Acme Industrial Co., Booth 28
American Instrument Co., Booth 71
American Optical Co., Booth 35
H. Reeve Angel & Co., Inc., Booth 30
Atlas Electric Devices Co., Booths 54, 55

Baldwin-Southwark Div., The Baldwin Locomotive Works, Booths 14, 15, 16
Boonton Radio Corp., Booth 72
Bowen & Co., Inc., Booth 18
Brookfield Engineering Laboratory, Booth 48
Buehler, Ltd., Booths 65, 66
Burrell Technical Supply Co., Booths 51, 52
Canadian Radium & Uranium Corp., Booth 34
Central Scientific Co., Booth 74
The Comtor Co., Booth 33
Eastman Kodak Co., Booth 13
Elgin National Watch Co., Sapphire Products Div., Booth 70
Engineering Laboratories, Inc., Booth 23
Gamma Instrument Co., Booth 56
General Electric Co., Booths 87, 88
General Radio Co., Booth 26
Hanovia Chemical & Mfg. Co., Booth 64
Kewaunee Mfg. Co., Booth 67
Kimble Glass Co., Booth 89
Krouse Testing Machine Co., Booth 73
Macbeth Corp., Booth 68
Magnaflux Corp., Booth 50
National Research Corp., Booth 49
North American Philips Co., Inc., Booths 36, 37
Tinius Olsen Testing Machine Co., Booth 75
Parr Instrument Co., Booth 22
Picker X-Ray Corp., Booths 90, 91
Precision Scientific Co., Booths 41, 42
Radium Chemical Co., Inc., Booth 24
Rainhart Co., Booth 12
Riehle Testing Machines Div., American Machine & Metals, Inc., Booths 61, 62, 77
Rubicon Co., Booth 38
Scott Testers, Inc., Booth 25
Sperry Products, Inc., Booth 27
Standard Electric Time Co., Booth 11
Statham Laboratories, Booth 39
C. J. Tagliabue Div., Portable Products Corp., Booth 53
W. M. Welch Mfg. Co., Booth 81
Will Corp., Booth 10
Wilson Mechanical Instrument Co., Inc., Booth 69

COMMITTEE BOOTH EXHIBIT

A-3	Cast Iron
A-7	Malleable Iron Castings
A-10	Iron Chromium, Iron-Chromium-Nickel and related alloys
B-1	Copper and Copper-Alloy Wires for electrical conductors
B-3	Corrosion of Non-Ferrous Metals and Alloys
B-4	Electrical Heating, Electrical Resistance and Electric Furnace alloys
D-2	Petroleum Products and Lubricants (Technical Committee G on Lubricating Grease)
D-7	Wood
D-9	Electrical Insulating Materials
E-4	Metallography
E-7	Radiographic Testing

DR. J. J. MATTIELLO

Hilo Varnish Corp., Edgar Marburg lecturer

German Process Improves Bessemer Steel

A GERMAN process whereby an attempt has been made to raise the quality of Thomas (basic bessemer) steel to the level of openhearth steel, is discussed in *The Iron and Coal Trades Review*, April 5, 1946. The new type steel produced, referred to as HPN, is said to have better mechanical properties than ordinary Thomas steel because special precautions are taken to reduce the phosphorus and nitrogen contents. HPN steel may be either rimmed or aluminum-killed. The nitrogen content varies in different qualities from 0.006 to 0.012 pct. The rimming quality HPN steel is regarded as intermediate between rimming openhearth and Thomas quality.

In this patented process the liquid iron is transferred from the mixer to a convertor which is smaller than ordinarily used in order to reduce the depth of the bath. The metal is blown in the usual manner for 8 to 9 min, or 2 to 2½ min before the flame drop, as determined by the experience of the blower. After the convertor has been turned down and the blast taken off, between 3500 and 9000 lb of iron ore, together with about 6000 lb lime, are added. The slag at this point is highly oxidized and a vigorous reaction results between the added ore and the carbon and phosphorus of the metal, the carbon monoxide liberated removing most of the nitrogen. The charge is finished by the addition of ferro-manganese instead of spiegel in order to maintain a low carbon content in the finished steel.

A typical analysis of this quality of steel is 0.05 pct C, 0.34 Mn, 0.022 S, 0.043 P, 0.008 N. In principle, any type of iron ore can be used in this process; in practice, however, ores with too low an iron content are not used—Swedish ores are excellent but are reserved for special purposes. In general the ores used are of the siliceous type in order to improve solubility of the Thomas slag made.

HPN steel is made without any special equipment and without temperature measurements. The pressure of the blast is always the maximum which the metal will carry. The time taken per charge is a little longer than for a normal bessemer heat because of the interruption of the blow and the ore and lime additions, but this is compensated by the higher yield of ingot per ton of raw material charged. HPN quality steel has been used for telegraph wire, forging ingots, ship plates, hard steels up to 114,000 to 128,000 psi and spring steel with 1.2 pct Si, 1.60 pct Mn.

Production Problems

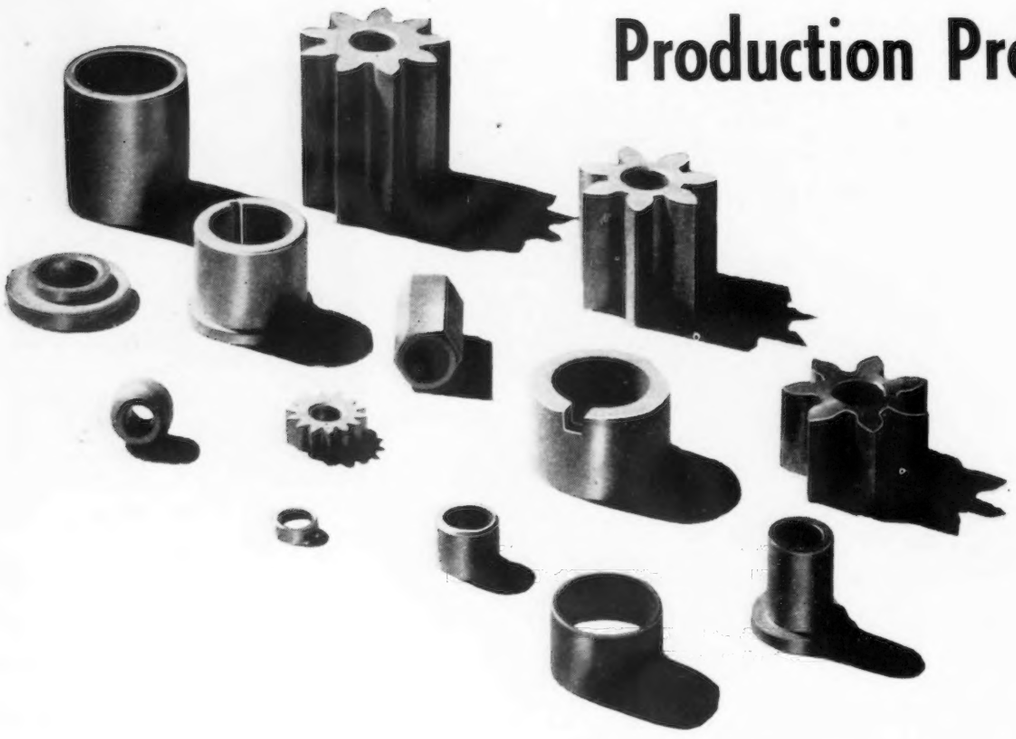


Photo courtesy of General Electric Co., Schnectady

PRESIDENT F. E. HALL welcomed approximately 170 registrants to the second annual spring meeting of the Metal Powder Assn., held at the Waldorf-Astoria Hotel, New York City, June 13, 1946. He pointed out the value of such a gathering of those interested in powder metallurgy, in view of the increase in types of applications to which powders were being utilized, based on the 1945 production of 200 million tons of all types of powders.

The morning session was devoted to the presentations of three papers: (1) "Use of Graphite in Iron Powder Compacts," by E. S. Glauch, Joseph Dixon Crucible Co., (2) "Furnace Atmospheres for Sintering," by H. M. Webber and A. G. Hotchkiss, General Electric Co., and (3) "Sintered High Density Tungsten and Tungsten Alloy Parts," by J. Kurtz, Callite Tungsten Corp. Condensations of the first two papers are presented in this report

A panel discussion under the chairmanship of A. J. Langhammer, Amplex Div., Chrysler Corp., touched on various phases of iron powder metallurgy. In his paper entitled "Fundamental Facts About Iron Powder Costs," B. T. du Pont of Plastic Metals Div., National Radiator Co., presented data to show why, at present, a "good 5¢ iron powder" is not practicable to produce. The strides made in the establishment of testing procedures were reviewed by J. E. Drapeau, Jr., Metals Refining Co., in a presentation "Testing Methods in Use in Determining the Properties of Iron Powders." It was pointed out in the discussion, however, that some of the test methods had been standardized for industrial purposes and were inadequate for use in the research laboratory.

F. V. Lenel of Moraine Products Div., General Motors Corp., discussed the variations in green density in the various grades of iron powders and the subsequent variations in tensile strength, elongation, hardness and impact strength (since these properties are a function of the green density) in his paper "Some Relationships Between Properties of Iron Powders and Parts Made From Them." He also emphasized that in order to get greater hardenability in steel products made from iron powders it was necessary that the alloying elements be prealloyed in the iron powder particles in a homogeneous solid solution. A floor discussion during the panel questioned the use of gaseous atmospheres for introducing carbon into iron powders, in lieu of the use of graphite—this method has previously been reported.[1] Another panel member, C. G. Goetzel, American Electro Metal Corp., presented a paper entitled "Physical Properties of Parts Made from Iron Powders," in which he described the methods used in order to obtain the maximum properties from iron powders. Examples are (1) heat treatment practice, (2) hot and cold-working operations, and (3) a process for increasing the density of sintered compacts by filling the pores.[2] F. P. Peters, editor, Materials and Methods, concluded the panel discussion with "An Editor's View of Ferrous Powder Metallurgy."

[1] *See* THE IRON AGE, *Feb.* 28, 1946, *p.* 60 *and Apr.* 25, 1946, *p.* 56.

[2] *See* THE IRON AGE, *May* 2, 1946, *p.* 50.

Use of Graphite in Iron Powder Compacts

In his paper, Mr. Glauch presented a report of a research program, the object of which was to note the effect of various types of graphite on the properties of

Studied by MPA . . .

Removal of existing limitations to the uses of metal powder products keynote of annual meeting of Metal Powder Assn.

steel parts made from pressed and sintered iron-graphite powders.

All the graphites tested are natural graphites except one (marked X) which is an artificial grade. Natural graphites are all crystalline allotropic forms of carbon and are classified by Joseph Dixon Crucible Co. as follows: (1) flake—grades 444, 200-16—has one small dimension which gives the graphite a laminated platelike structure, (2) crystalline—8485, 200-12, 200-10, 200-09—is of approximately equal dimensions and resembles massive crystals, and (3) amorphous—0703—earthy and matte and composed of microscopic crystals.

All experiments were conducted with one grade of powder—a powder produced by electro deposition—called "Plast-Iron," with an apparent density of 2.45 g per cc and relative flow of 95 pct. Other constants were (1) graphite addition = 0.85 pct (wt), (2) compacting pressure = 50 tons per sq. in., (3) sintering temperature = 1100°C (2012°F), (4) sintering time = 1 hr, (5) sintering atmosphere = dissociated ammonia, (6) cooling rate = ½ hr in reducing atmosphere, and (7) mixing technique—iron and graphite powders tumbled for 1 hr and the blend then screened through a 100-mesh sieve.

The variable conditions were as follows: (1) the iron powder was used in two conditions, unreduced and hydrogen-reduced. (2) flat tensile test specimens (1.821 x 0.250 in.) were made to two lengths, 3 in. and 4 in., (3) the sintering atmosphere was used in two ways, directly as produced by the cracking furnace, and by passing through phosphorus pentoxide drying tower after coming from the furnace, and (4) during sintering the specimens were held in two types of containers, an open iron boat and a closed graphite tube.

Results of the tests are summarized in table I. No significant variations in sintered density were found, the overall values ranging from 6.88 to 7.19 g per cc. The effects of the variable test conditions on hardness and tensile strength values can be compared for grades 8485 and 444. Testing under condition D, in which a closed graphite tube was used (rather than the open

TABLE I

Test Results on Sintered Iron-Graphite Compacts

Graphite Grade.	Test Condition	Hardness, RB	Elongation, Pct in 1 in.	T.S., Psi
8485	A	39	.....	45,600
	B	31	.....	43,200
	D	53	3.0	51,100
	E	58	3.0	55,600
	F	63	3.0	56,700
444	A	40	.....	44,000
	B	33	.....	42,000
	C	39	3.0	43,000
	D	51	3.0	47,800
	E	75	2.0	67,400
	F	69	3.0	66,000
X	A	46	.....	41,700
	E	65	.....	53,300
0703	A	21	.....	28,000
200-12	E	76	.....	54,600
200-10	E	76	.....	58,700
200-09	E	69	.....	62,200
200-16	E	77	.....	63,000

A—Unreduced powder, 3-in. specimen, atmosphere direct from dissociator, sintered in open iron boat.
B—Unreduced powder, 4-in. specimen, atmosphere direct from dissociator, sintered in open iron boat.
C—Unreduced powder, 4-in. specimen, atmosphere through drying tower, sintered in open iron boat.
D—Unreduced powder, 4-in. specimen, atmosphere through drying tower, sintered in closed graphite tube.
E—Reduced powder, 4-in. specimen, atmosphere direct from dissociator, sintered in closed graphite tube.
F—Reduced powder, 4-in. specimen, atmosphere through drying tower, sintered in closed graphite tube.

boat), shows a definite increase in hardness and strength, even with the use of unreduced iron powder; going to reduced powder (condition E), continues the trend; and drying the sintered atmosphere (condition F) further increases these properties.

Of the entire series of graphites in combination with reduced iron powder, graphite 444 showed the highest tensile strength, followed by 200-16, 200-09, 200-10 and 8485 in that order; the amorphous grade (0703) showed the lowest values of all.

Ductility (elongation) was determined for only a few samples; no significant variations were found.

A lively discussion followed presentation of this paper, and one of the points brought out was that the flat, pressed-type tensile bars used in these tests usually give low, nonrepresentative values.

Sintering Atmospheres

Furnace atmospheres, as important a factor in the sintering of powder metal compacts as in the normal heat treatment of ferrous and nonferrous metals and alloys, was discussed in the paper by H. M. Webber, Industrial Heating Div., and A. G. Hotchkiss, Industrial Heating and Welding Engineering Div., General Electric Co., Schenectady. The presentation described the uses and means of production and control of hydrogen, dissociated ammonia and partially burned fuel gas atmospheres.

Hydrogen, popular as an atmosphere for many years, is commonly made by the dissociation of water into its components, hydrogen and oxygen, in a battery of electrolytic cells. It is with comparative ease that iron is brought out bright from hydrogen atmospheres. However, oxygen and water impurities form selected oxides at elevated temperatures with chromium, manganese, silicon, vanadium, zinc, aluminum, beryllium, titanium, etc.; accordingly when compacts containing these constituents are being sintered, it is sometimes necessary to purify the hydrogen. For example, (1) It is said that a slight amount of oxygen or water vapor in hydrogen will oxidize the ferroaluminum in sintered Alnico magnets, limiting the amount of sintering and impairing the quality, (2) for sintering tungsten and molybdenum the oxygen and moisture must be removed and (3) for cemented carbides the water vapor is generally removed from the hydrogen and the work is enclosed in graphite boxes to effect oxygen removal.

Both oxygen and water vapor are relatively easy to remove from hydrogen so the purification process is quite practical. Two schemes for removing oxygen are (1) to pass hydrogen over copper heated to about 1100, to 1200°F and then passing the resulting partially purified hydrogen over hot ferromanganese, ferrotitanium or ferrosilicon at 1650, to 1850°F to remove all traces, and (2) to pass hydrogen through a palladium catalyst purifier—which is said to be highly superior to the former type in that it is less expensive and more convenient and economical to operate.

In order to remove moisture from the gas, the bulk of the moisture can be removed by refrigeration methods and additional drying for good sintering results can be obtained by passing the gas through an activated alumina dryer or through silica gel. Hydrogen from a palladium catalyst purifier, passed through an activated alumina dryer is reported to have sufficient purity to sinter 18 pct chromium-8 pct nickel compacts, Alnico, 80 pct nickel-20 pct chromium, etc., and to reduce oxides of chromium.

o o o

F. E. HALL
Metals Disintegrating Co., Elizabeth N. J.,
President Metal Powder Assn.

o o o

Dissociated ammonia, a high purity gas mixture, which is sometimes used as a low cost substitute for hydrogen, is made by cracking anhydrous ammonia at about 1650°F over a catalyst. Because of its relatively high purity dissociated ammonia has a wide field of application—among the various metals reported to be successfully sintered in this atmosphere are: iron and steel powders, brasses, bronzes, pure copper, tungsten, and stainless steel (except those containing titanium or columbium or campacts made of molybdenum powders).

Partially Burned Fuel Gas—the most common gas used for sintering furnace atmospheres is combusted gas, resulting from the partial combustion of hydrocarbon fuel gases with air in atmosphere gas converters. The fuel gases commonly employed for burning in atmosphere gas converters are coke oven, natural and propane gas. This gas has a great variety of uses which depend upon the air: gas. For example, a 6:1, air: gas ratio is commonly used for sintering iron compacts while the 8:1 gas is usually used for bronze sintering.

Compacts containing copper or nickel are subject to discoloration if the combusted gas contains sulfur. A typical procedure for removing sulfur is to first pass the combusted gas through a water spray tower to remove sulfur dioxide and then pass it through a tower containing iron oxide on wood shavings which removes hydrogen sulfide. From here the gas goes to the furnace completely free from sulfur.

Where decarburization is prohibitive, carbon dioxide must be removed. Removal of this impurity can be accomplished by passing the gas through a scrubbing tower, where the carbon dioxide is completely removed by absorption in a monoethanolamine solution.

The authors mention the wide variety of gas analyzers on the market which cover both intermittent and continuous types of equipment. For sintering work on iron parts requiring no decarburization, an occasional quick check on the carbon dioxide content, with various types of carbon dioxide analyzers available in the market, of the gas entering or leaving the furnace, or both, or a continuous record is generally desirable for process control. Also, dew point indicators are available to check the moisture content.

Gear Production Increased by Underpass Gear Shaving

A COMBINATION of two developments in gear finishing—underpass shaving and curve shaving—is credited with boosting output per gear finishing machine some 200 pct in the plant of a major motor vehicle producer. The comparative runs were made on a cast-iron timing gear of 8 pitch, 24 tooth type, with a 7/8-in. face. Stock removal in finishing was approximately 0.004 to 0.006 in. over pins.

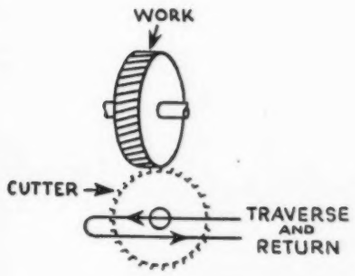
The gear had been finished regularly with a conventional gear finisher employing axial cutter reciprocation and a rocking motion to relieve the gear teeth. Approximately 36 gears were produced per hour on each machine.

The first Michigan Tool Co. underpass curve shaver installed gave an output of 110 gears per hr. This machine operates on the principle of tangential rather than in-feed of the cutter, and does not use lateral cutter reciprocation. The cutter is merely reciprocated once tangentially to the gear while the two are rotating in mesh, as shown in fig. 1.

With the axes of the cutter and gear crossed, the cutter is moved tangentially under the gear. Cutting action starts on both tooth faces and at one end of the teeth as the cutter is moved along the tangent line towards the gear. The cut sweeps across the gear face as the cutter moves past, and then reverses to again sweep across the face, imparting the desired finish to the teeth as the cutter returns to its original position.

A close-up view of the operation is shown in fig. 2, and it is claimed that this method results in a smooth, even cut, distributing the wear across the entire face width of the cutter instead of concentrating it on the center as in a conventional shaver. The curve-shaving action which retains the correct involute form throughout the length of each tooth, but thins the cross section down a few thousandths towards the ends of the teeth, is built into the cutter itself. This eliminates the necessity of a mechanical action to change the relative cutter to gear positions.

As shown on the chart, fig. 3, the accuracy of the involute can be held to close limits despite the high output rate of the machine. Spacing errors are said to be less than 0.0003 in., and eccentricity to be below a maximum of 0.0015 in.



ABOVE

FIG. 1—The principle employed in underpass shaving is clearly shown by this sketch.

RIGHT

FIG. 3—The accuracy of the involute obtainable by underpass shaving can be judged by this check chart of a regular production gear.

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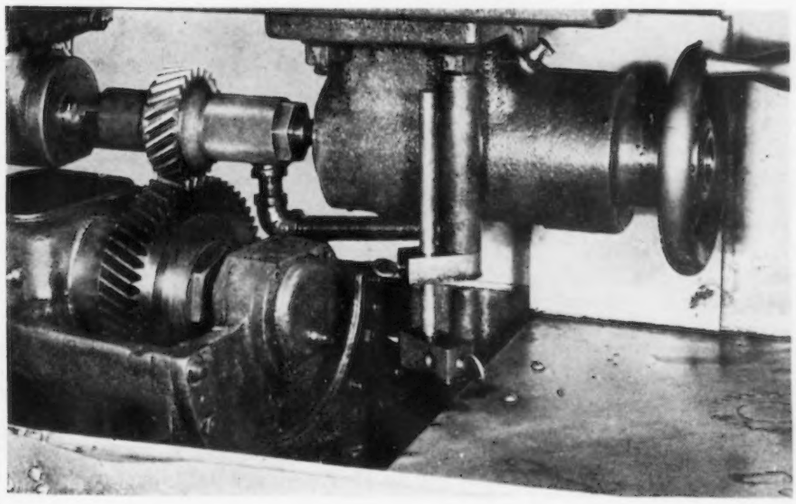
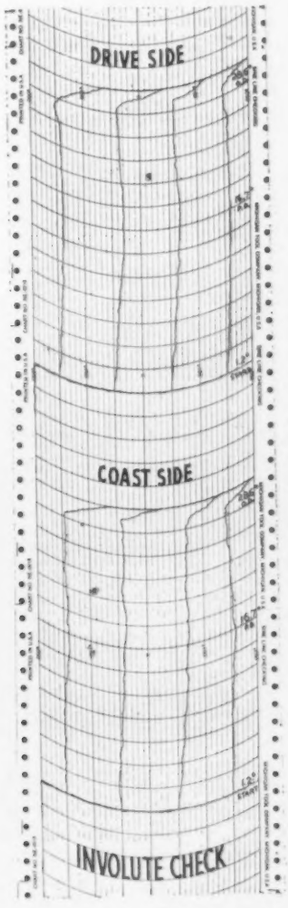
BELOW

FIG. 2—Close up view of the Michigan underpass gear shaver. Gears shown are produced at the rate of 110 an hour with 0.004 to 0.006 in. stock removal.



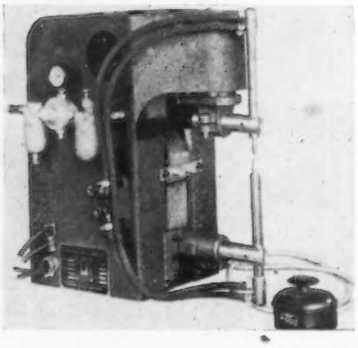


New Equipment . . .

Welding

Improvements in gas and diesel driven welders, bench type butt and spot welders, and gas cutting units are discussed in this review. A tweezer spot welder, portable induction heater, and mobile brazers are also included among the units described.

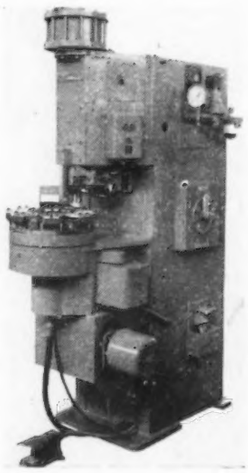
AN automatic bench-type air-operated spot welder, known as the 7½ kva Midget, has been produced by the *Universal Welder Corp.*, 769 Carnegie Ave., Cleveland 15. This unit, which parallels the 3-kva welder, has increased capacity and uses. Four steps of adjustable weld heat control deliver a secondary maximum of 12500 amp so that it may weld two thicknesses of 16 gage sheet steel. An air accessory unit insures clean lubricated air delivery to the air cylinder. Operating equipment includes an improved pressure switch, fast four-way solenoid air valve, a heavy duty butt contact type inbuilt welding contactor. An air flow regulating valve is provided for adjustment of point impact speed, and water cooled electrode holders are for No. 1 Morse taper welding tips. Initiation of welding cycle is by a foot switch. Standard units have



a throat depth of 9 in. Up to 16 in. can be obtained by factory modification of the upper cylinder press head mounting. The lower arm is adjustable up and down.

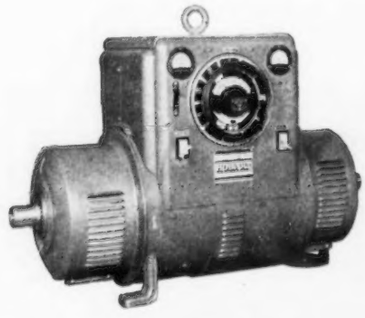
Dial Feed Welder

DESIGNED to weld two assemblies simultaneously, a circular dial feed press type welder has been produced by the *Taylor-Winfield Corp.*, Walter and Anderson Sts., Warren, Ohio. The indexing of the dial is obtained by use of a Geneva motion, motor driven through a suitable gear arrangement. Correct sequence operation of the welding head is insured by a drum switch of the adjustable fan cam type which permits welding only during the locked interval of the Geneva. A single air cylinder, connected to two heads through an antifriction bearing equipped equalizer bar, insures identical pressures on the two welding dies. The heads are of the square quill type mounted side by side in common slide. The dies of the two heads are connected to the two pads of the transformer secondary by flexible copper bands. Each of the several die holders is mounted on a copper table, the lower surface of which is water cooled. As current flows only from one die to the next die through a dual die holder, no insulation is necessary excepting of the work locators. The welder is equipped with automatic work ejectors. A stripper is provided so that work which adheres to the dies is automatically held in its locator until the head lifts.



Synchronous Motor Welder

BY utilizing the inbuilt separate exciter of the Hobart electric drive welder, *Hobart Brothers Co.*, Troy, Ohio, has produced a compact, high performing, synchronous motor welder. The unit is so proportioned that it can be started across the line and automatically synchronize itself by the build up of the separate exciter. The starting current on this unit is approximately the same as a conventional induction motor of the same horsepower capacity. The motor of this welder is a Hobart revolving field synchronous type. It is furnished with heavy squirrel cage winding to make easy starting as a conventional induction motor. Once up to speed the exciter builds up and

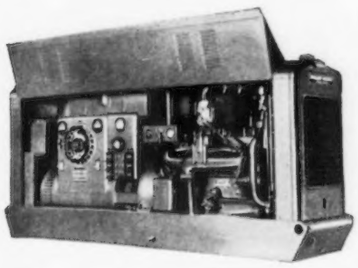


automatically applies correct excitation to motor fields.

Gasoline-Driven Arc Welder

DEVELOPMENT of a 300-amp gasoline-driven arc welder with an inbuilt auxiliary ac generator has been announced by the *Hobart Brothers Co.*, Troy, Ohio. This compact, high performing de-

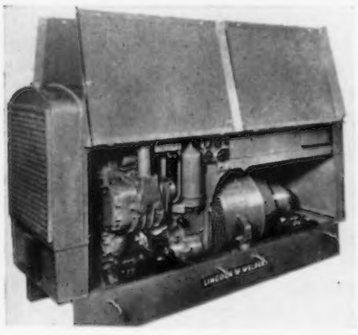
sign has resulted by taking advantage of the Hobart oversize separate exciter, using it to supply excitation to both the welding generator and the ac generator. By connecting the stations and panel of the ac generator, several combinations of power can be furnish-



ed simultaneously. The panel provides receptacles and studs for connecting to the power required, an ac voltmeter with dual scale, frequency meter, and rheostat for controlling the ac voltage.

Diesel-Driven Welder

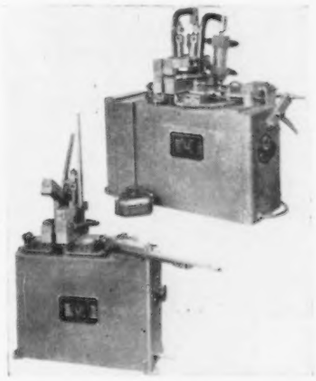
MADE for use in locations where electric power is not available, or not economical, a diesel engine driven welder of 300-amp capacity has been announced by the *Lincoln Electric Co.*, Cleveland 1. Powered by a two-cycle diesel engine, this welder is said to cut fuel costs up to 86 pct, depending upon the price of fuel oil used. Dual continuous control permits the operator of the welder to select any type of arc and any arc intensity to suit the job, thus improving the speed, quality, and ease of welding. The welding generator has NEMA



rating, 300 amp at 40 v. Current range for welding duty is from 20 to 40 v, 60 to 375 amp. The generator supplies uniform current for metallic arc welding in any position with bare or heavily coated electrodes, also for carbon arc welding. This Shield-Arc welder weighs 2560 lb and can be mounted on wheels, trailer or truck for easy portability.

Bench Model Butt Welder

HAND-OPERATED and air-operated Midget butt welders have been added to the line manufactured by the *Universal Welder Corp.*, 769 Carnegie Ave., Cleveland 15. These bench model precision welders are available in 10 kva and 20 kva with either hand or air-operated clamps and with either hand or air-operated push up features. In the manual type machines these units afford a rugged butt welder capable of welding intermittently up to ½ in. round steel and larger for infrequent use. Air-operated push up units are designed for butt welding fabricated wire products up to ¼ in. steel. They are said to be especially adaptable for fabricating small steel molding strip, bicycle wheel steel rims and similar items. The



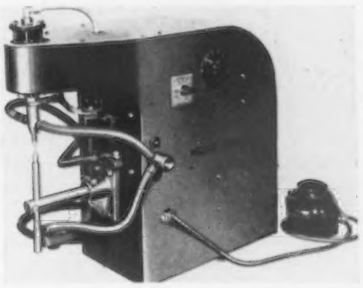
air-operated units are equipped with a foot switch that starts the cycle by clamping the weldment, followed automatically by the completion of heating, weld, push up, and release of the welded part.

Bronze Electrodes

ANNOUNCEMENT of a Murex line of heavy-coated aluminum bronze and phosphor bronze electrodes has been made by the *Metal & Thermit Corp.*, 120 Broadway, New York. These new electrodes make available a wide range of bronze alloy deposits varying in chemical analyses and in mechanical properties from high tensile strength and ductility with comparatively low hardness, to medium strength with zero ductility and relatively high hardness. The deposits are said to have good wearing and bearing characteristics and excellent corrosion resistance.

Bench-Type Spot Welder

RECOMMENDED for spot welding of lightweight metals, metals up to 18 gage cold-rolled



steel, or equivalent, a bench-type spot welder has been announced by *Weldex, Inc.*, 7344 McDonald Ave., Detroit 10. This machine, known as Weldex Model 263-A, is a 3 kva, 220 v, 60 cycle, single phase unit. It is air-operated, foot-controlled, electronically timed, and has an adjustable pressure switch. The machine measures 21 in. high, 10 in. wide, and 23 in. deep, and weighs 135 lb.

Tweezer Spot Welder

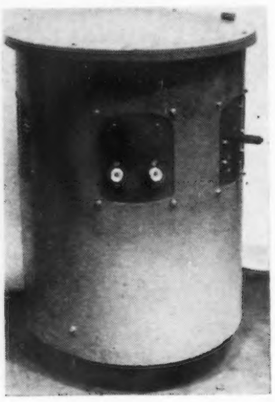
DEVELOPED for welding tiny parts, the Besco tweezer spot welding machine has been announced by the *Tweezer-Weld Corp.*, 280 Plane St., Newark 2, N. J. This portable unit consists of a cabinet to which is connected a pair of insulated, forged copper tweezers and a foot switch. It uses 115 v 60 cycle power and may

be adapted to 220 v. With the use of the tweezers, the electrodes may be applied directly to the elements to be joined. The tweezers probe for the parts, hold and bend them, and weld. Its applications are said

to be unlimited for industries fabricating metal parts measuring 0.0005 to ⅛ in. round or thick. To weld parts from 0.015 through ⅛ in. round, the machine is used with an auxiliary booster unit which increases the capacity of the equipment by 300 pct, it is said. The tweezer leads are flexible, plastic covered, and 18 in. long. The points require touching up only once a day.

Mobile Brazers

DESIGNED for general brazing service, a 20-kva portable brazer with water-cooled tongs has been announced by the *Westinghouse Electric Corp.*, Box 868, Pittsburgh 30. Enclosed in a circular steel housing, the entire unit is selfcontained, having a contactor for energizing or de-energizing the brazing circuit, an adjustable heat

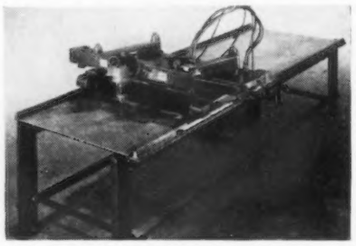


brazing transformer, and a water-cooling system for the tong cooling water. The diameter is kept small (24 in.) so that the machine can be lowered through hatches, watertight doors, and manholes. A clamp-type entrance bushing is provided on the rear of the brazer for the incoming primary cable. The unit requires connection to a 220 or 440-v power source.

A portable 10-kva brazer with air-cooled tongs has also been announced by *Westinghouse*. This single phase, 60-cycle unit weighs 100 lb, is provided with four large caster-type wheels and two handles for quickly moving or carrying any place in the shop or yard. It requires connection to a 220 or 440 source. Alternating current from an adjustable voltage transformer passes through the tongs and parts to be brazed.

Shape-Cutting Machine

TO do precision cutting on work of intermediate size, an Oxweld oxyacetylene shape-cutting machine, the CM-15-36, has been designed by the *Linde Air Products Co.*, a unit of Union Carbide & Carbon Corp., 30 East 42nd St., New



York 17. An attachment is available for this machine which makes it possible to mount the blowpipes on both sides of the tracing table, thus permitting the cutting of identical shapes simultaneously from plates on both sides of the tracing table. The attachment can also be used to great advantage, it is said, in eliminating down time, since plates can be put into position on one side of the machine while cutting is being done on the other. The transverse working range of this machine is 36 in.; the longitudinal working range with the standard table is 100 in. The tracing head is powered by a 110-v universal motor, and has a variable speed ranging from 3½ to 28 in. per min. The machine, as shipped, is equipped for either mechanical tracing with strip templet or hand-tracing.

Cutting Torch

MANUFACTURED by the *Wall Chemicals Div.* of *Liquid Carbonic Corp.*, 3100 S. Kedzie Ave., Chicago 23, a Gasweld Featherweight cutting torch has been designed for light metal cutting. The

torch weighs 2 lb, 2 oz. and is 16 in. from tip to butt of handle, making it ideal for close-quarter work on sheet metal in pipe shops, scrap yards and garages. It is equipped with a ribbed brass handle for positive grip, and tubes of nickel-copper alloy in triangle assembly for strength and rigidity. Available with either 80° or 90° forged head, the Featherweight has a one-piece tellurium copper tip.

Portable Induction Heater

DEVELOPED to meet the need for clean soldering of small parts, and for soldering of metal to metallized glass and ceramics, a portable bench-type induction heater has been produced by the *Marion Electrical Instrument Co.*, Manchester, N. H. The circuit design is such that the operation of the heater offers less hazard than a soldering iron, it is claimed, and yet does a neater, cleaner and faster job. There is no danger of sparking or radio frequency burns from the output terminals or work coil. The coupling link, operating at low impedance, is provided with a grounded center tap. Two

switches constitute the controls: one, a standby switch, controls the power to the tube filaments, and the second, the operating switch, controls the high voltages to the tubes. This switch circuit may be operated by foot treadle when desired. The circuit has been designed to provide maximum conversion of the 60 cycle power into heat. This induction heater is furnished in a standard relay rack cabinet, measures 15¾ x 21½ x 15 in., and weighs 150 lb.

Welding Cable Splicer

FOR providing a quick repair of broken cables or salvaging short lengths, welding cable splicers have been announced by the *Tweco Products Co.*, Wichita 1, Kans. A simple clamp cable connection on each end of the splicer, with provision to solder between the cable ends, is said to assure an efficient connection. A fiber sleeve covers this splicer which is permanent and easily installed. The splicer is made in three sizes to cover the full range of welding cables.

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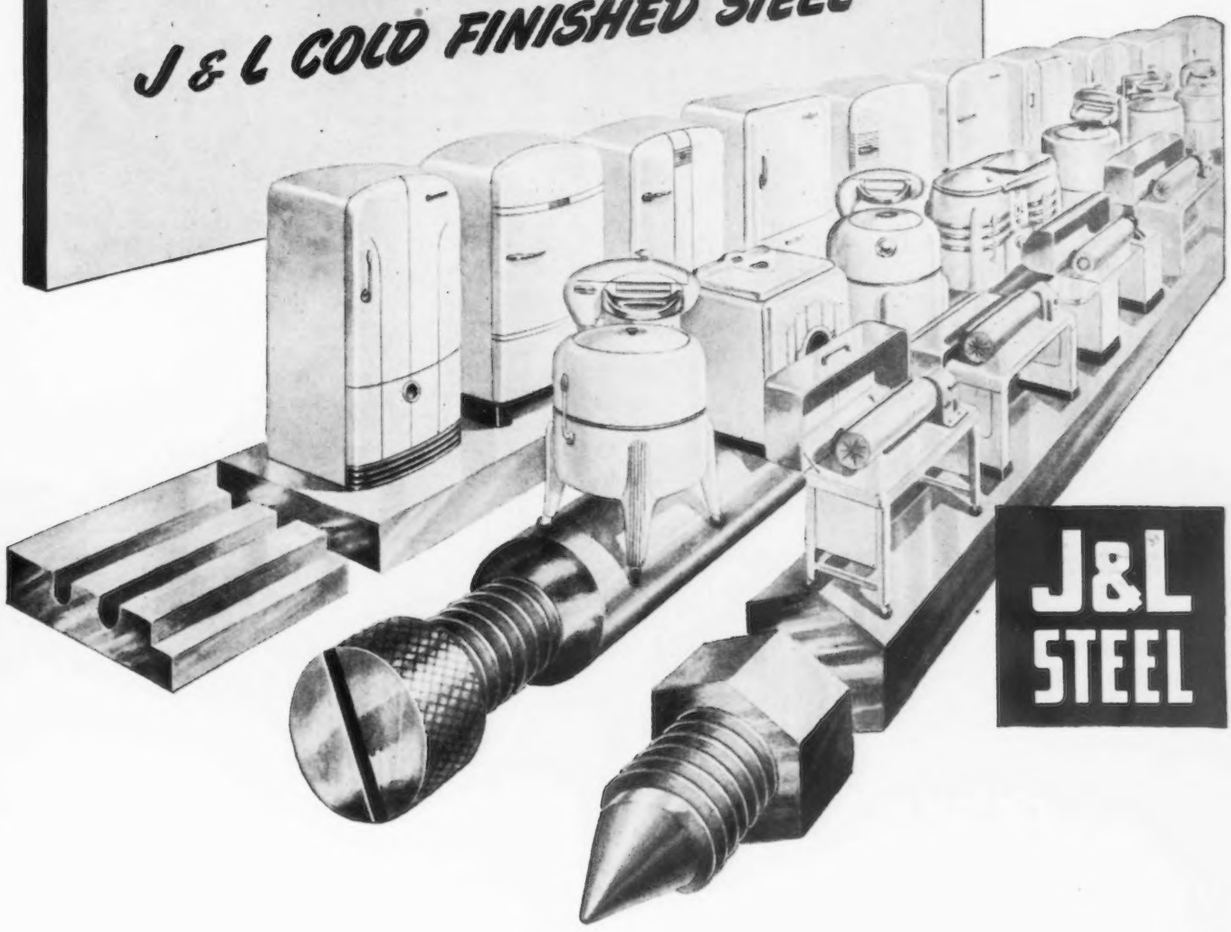

Your machine parts can be made at lower cost from J&L Cold Finished steel because it is uniform. This means faster cutting speeds, less tool wear for you.

At J&L, steel for cold finishing is made expressly for that purpose. The required quality and grade are specifically outlined when the iron is made in the blast furnace, converted into steel at the Bessemers or open-hearth furnaces and rolled into bars or special shapes. The long experience of Jones & Laughlin in the production of Cold Finished steel from the time the process was invented by them further assures the uniform quality of the product—a quality that will enable you to step up your production of accurate machine parts. Write for further information.

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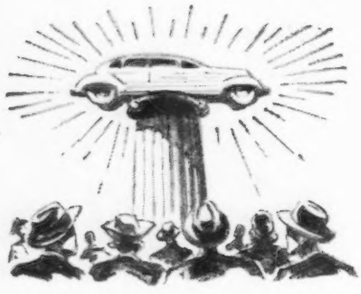
PITTSBURGH 30, PENNSYLVANIA

Assembly Line . . .

WALTER G. PATTON

• Auto output hobbled by parts shortages . . . Frazer car being produced on a pilot basis . . . Torsion springing may be tried on heavy vehicles.



DETROIT—Hobbled by more than 100 work stoppages in supplier's plants, the automobile industry produced 43,175 units last week, an increase over the 31,895 units turned out the previous week but far below the 133,645 vehicles assembled during the corresponding week of 1941.

High carbon spring wire was the top item on the scarcity list last week but there were many other materials in short supply. To name only the items which come quickly to mind the list includes sheet metal, axle housings, castings and forgings, springs and upholstery.

Settlement of the coal strike will undoubtedly give a lift to automobile production but the extent to which output can be boosted and maintained will depend in the long run on the balancing of parts inventories. Until the labor and parts situations are much better in hand than they happen to be at the moment, balanced automotive inventories seem to be out of the question.

Settlement of the Houdaille-Hershey strike should alleviate to a considerable extent the troublesome bumper shortage which has been an automotive headache for months. There is likewise good news for the new car buyer who, whether he realizes it or not, is getting better protection against corrosion on bumpers than he got even before the war. Prior to the outbreak of hostilities, automobile bumpers were given a plate consisting of 0.01 Ni and 0.00001 Cr. To conserve alloys, bumper plating specifications were changed in 1942 to approximately 0.0006 Cu and 0.0021 Ni and the usual 0.00001 Cr.

To insure longer life and greater freedom from corrosion, the bumper specifications commonly in use today call for a Ni plate of 0.015 Ni (and as high as 0.002 on some cars) with 0.00001 Cr. These new plating specifications should give the car owner more satisfactory service since it is the nickel rather than the chromium which contributes most in resisting corrosion on bumpers. As a matter of fact, a heavy chromium plate is actually said to be deleterious insofar as bumper life is concerned.

It is also interesting to note that bumper manufacturers are not much concerned over the possibility that plastic bumpers will replace steel at least in the immediate future. Those who have looked carefully into the prospects for plastic bumpers have concluded that the adverse effect of weathering on plastics and the possibility of low temperature embrittlement, when combined with the strong appeal of gleaming chromium plate to the average car buyer will keep plastic bumpers off passenger cars even though their physical and corrosion properties turn out to be entirely satisfactory. In addition, it is difficult to see how, under present conditions, a bumper made of impregnated fiberglas is going to compete on a cost basis with normalized high carbon or as rolled low alloy steel.

Production of Frazer passenger cars at the former Willow Run bomber plant is scheduled to start this week. In the beginning only pilot operations will be undertaken, using one of two assembly lines. The Frazer will be produced first by Graham-Paige Motors Corp.; production of the Kaiser Special by Kaiser-Frazer Corp. is not expected before mid-August. Latest information indicates that introduction of the front-wheel-drive Kaiser may have been set back as much as a year by the manufacturing and supply difficulties which have been encountered.

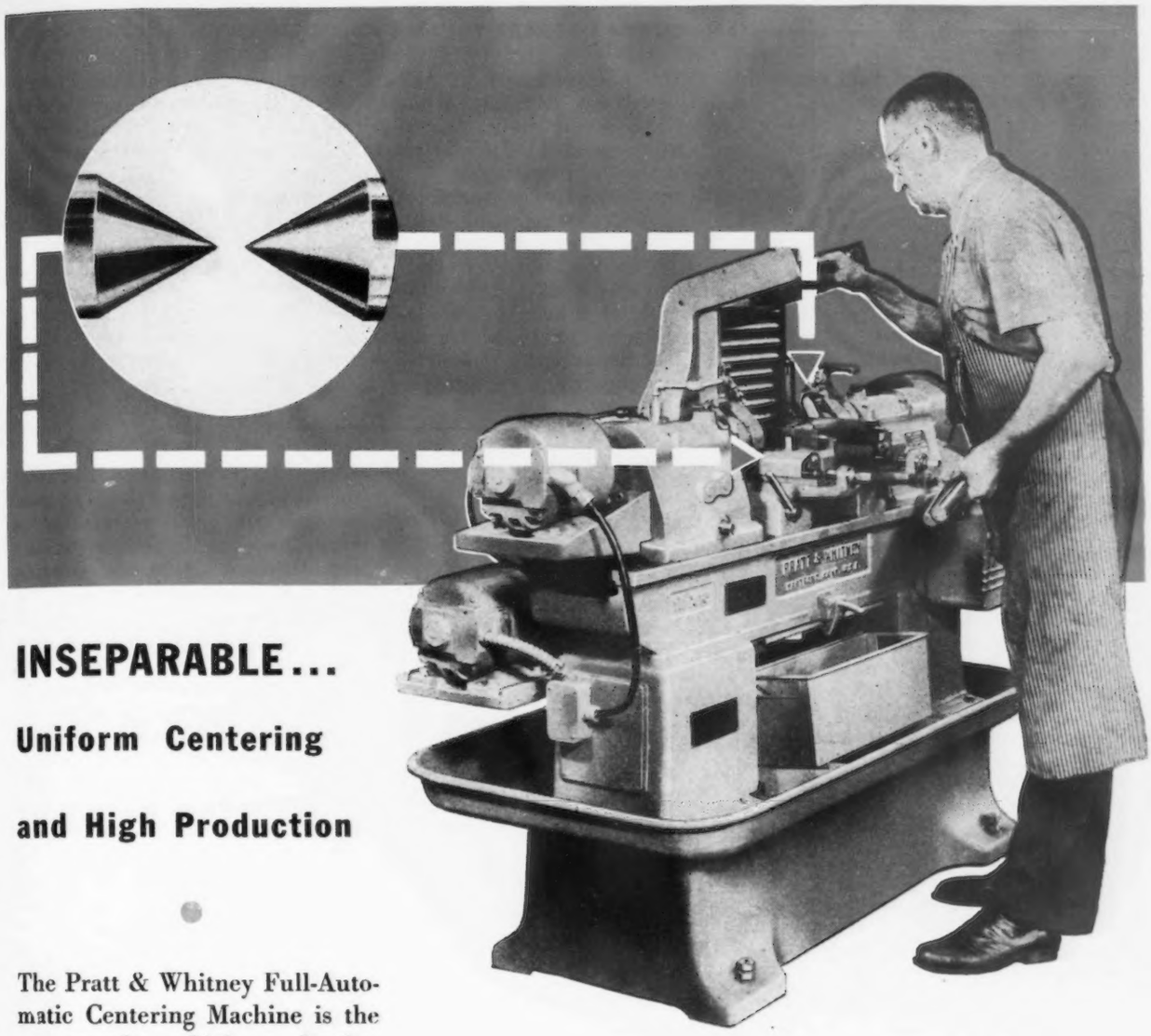
FOR the present, body panels produced by Hayes Mfg. Corp. of Grand Rapids will be assembled at Willow Run. Eventually Kaiser-Frazer expects to make its own bodies and presses are being installed for the purpose.

Like other motor car producers, Kaiser-Frazer has been handcuffed by parts shortages resulting from strikes in the plants of automotive suppliers. While substantial stockpiles of parts other than bodies are reported to be piling up at Willow Run, it is unlikely that large scale output can be attempted until the flow of parts from suppliers is much greater than it is now.

Approximately 3000 persons are said to be on Willow Run payrolls at the present time with peak employment estimated to reach 10,000. During the first full year of production, the company plans to assemble 300,000 units for distribution to its 146 distributors and 4000 dealers. This is equivalent to about six cars per month per dealer for the 12-month period.

It is not foreseen here that the use of steel torsion bar springing for passenger cars will make great headway in the automobile industry in the immediate future. Kaiser-Frazer has announced its intention to use this method of springing on the new Kaiser but other motor car producers remain cool to the possibilities of using torsion bars on light cars.

There are difficulties in installing this method of springing on present cars and some expensive design changes will be necessary. Moreover, the steel used must be of highest quality and entirely free from surface defects which could readily lead to fatigue failures. Available evidence leads to the conclusion that any improvement in riding comfort to be gained by the use of torsion springing on a light car would be obtained at disproportional cost to the car producer. As a matter of fact, some automotive engineers will contest the claim that there are advantages in



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The centering machine handles work from ¼" to 1-½" diameter, from 3-½" to 18" long, with an output varying from 4 to 10 pieces per minute. One operator easily handles several machines, for, after the initial set-up, it is only necessary to feed the magazine and take away the finished parts.

Fast, accurate, economical — the Pratt & Whitney Full-Automatic Centering Machine will make an excellent addition to your production equipment — and teams up splendidly with its companion machine, the Pratt & Whitney Full-Automatic Lathe.

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torsion bar springing on light cars which would be readily apparent to car buyers and which cannot be obtained by independent wheel suspension.

ON the other hand, steel torsion bar suspension has already been adopted for heavy trailers and this development seems certain to receive attention from all producers of heavy vehicles. With truck production normally ranging from 1,250,000 to 1,500,000 per year, a potential market of considerable tonnage for new types of alloy steel is possible in this field. Greater hardenability is required in torsion bars than for conventional coil or leaf springs and this would result in considerable shifting of steel specifications for springs.

In the meantime, B. F. Goodrich Co. has introduced to the automobile industry its new "torsilastic spring" for which the following advantages have been claimed: An inherently low degree of harshness and low noise level, minimum maintenance expense, long life with low operating cost, and ability to hold an automobile chassis at a designed level regardless of load changes.

The torsilastic spring made considerable progress during the war when nearly half a million installations were made on 20-ton amphibious LVT's (landing vehicles, tracked) otherwise known as Alligators and Water Buffaloes. A version of this spring design is currently being specified for new urban buses of the Twin Coach Co.

The torsilastic spring consists of a metal shell and a central shaft, with the space between shell wall and shaft filled with rubber firmly bonded to the metal. Either the shaft or the shell may be held stationary (usually to the car frame) while the other is partly rotated by means of a torque arm which in the case of an experimental demonstrator car was the wheel support arm. Springing is accomplished simply by the twisting movement in the rubber.

It is claimed that the torsion rubber suspension lends itself nicely to the use of a constant-level mechanism. Goodrich engineers also point out that the torsilastic spring is being applied to swivel chairs, porch swings, built-in ironing boards, truck tail gates and similar applications.

Armored Cable Price Hiked Again by OPA

Washington

• • • **Effective June 14,** OPA granted manufacturers of armored cable a second interim price increase averaging about 11.3 pct. This increase is in addition to an increase in the price of these products averaging 14 pct granted last May 8. The two increases will apply until a final price adjustment is allowed after computations of data being called by OPA in an industry survey are completed. OPA said that because the two interim increases allow for some but not all cost increases, the increases provided by them will be less than the final adjustment.

It was pointed out that in line with industry's practice, the total increase just granted has been rounded out to the nearest 10¢ in such a way as to prevent an accumulation on top of the rounding out procedure permitted in the first interim increase. The total cost increase on which the action was based was adjusted to allow for the industry's practice of granting 5 pct cash discounts.

Resellers of armored cable may pass on the dollar-and-cent increase in their net costs resulting from this action. Their margins on this product are so low that they cannot absorb the increase, OPA said.

OPA's latest action also permits manufacturers of armored cable who on the base date made a practice of selling to chain stores at Zone 1 prices wherever the stores may be located to continue to do so providing these sales are limited to the same chain stores as they supplied on the base date.

WORKS WITHOUT SEEING: *A totally blind war veteran, Harold Wesley Marston, 28, is doing a creditable job as a machine operator at the Buick Motor Div. plant at Flint, where he was employed before the war. He is shown here sliding a selector control rod into the slot of a small punch press.*

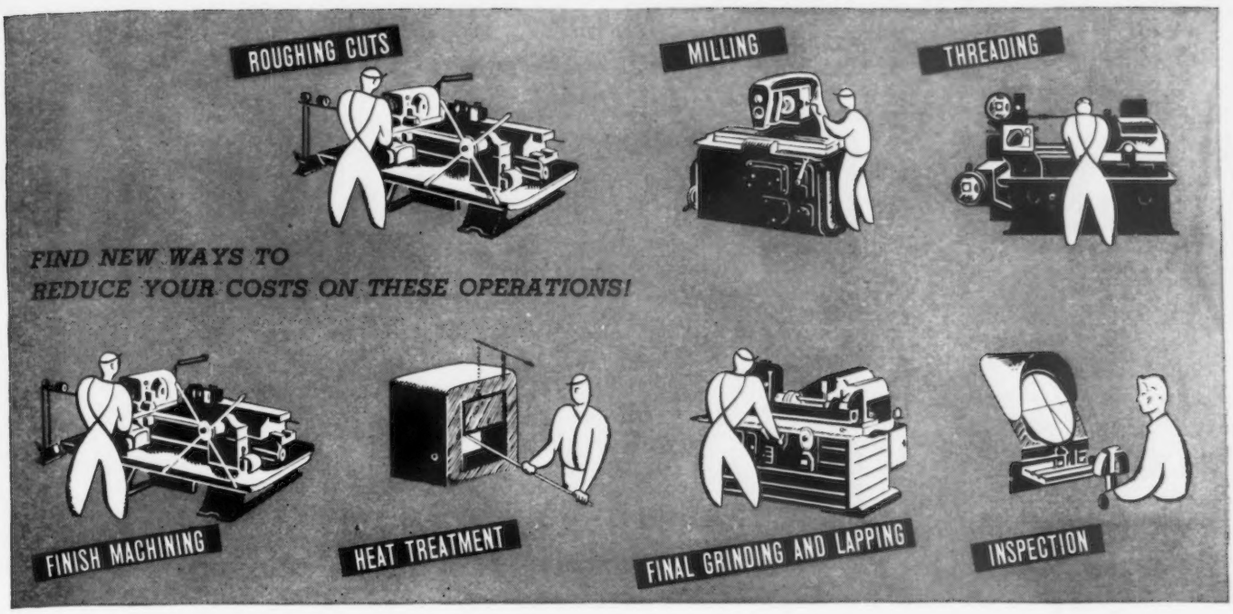
May Decontrol Machinery

Washington

• • • **Decontrol of a** substantial portion of construction machinery and equipment within a month is seen as a possibility following action of OPA in extending from June 15 to July 15 the expiration of the 10 pct interim price increase.

This is the second extension of the expiration date pending completion of the study of data submitted to the pricing agency for analysis and determination of a permanent increase percentage.

In the meantime, however, additional data have been submitted and the industry's advisory committee has strongly recommended suspension of price control on most of this type of products.



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You can expect new things from Carpenter Special Purpose Alloy Steels. They will do things that other alloy steels won't do. These steels are "tailor made" to fit your job requirements. Because they arrive at your plant in a condition that is close to your finished product requirements, they often save you time and money in fabrication. And because they are consistently uniform lot after lot, these steels help you reduce rejects, improve product performance and eliminate many servicing calls.

For a moment consider not the price of the material coming into your plant, but the cost of the product that leaves it. Actually, Carpenter Special Purpose Alloy Steels are "operation reducers" . . . furnished with a heat treatment, finish or close tolerance that *cuts your fabricating costs and reduces rejects.*

If you are interested in finding ways to cut costs with Carpenter Special Purpose Alloy Steels, ask for a copy of "Fitting the Steel to the Job". It is a new booklet that points the way to lower costs on jobs where you use alloy steels.

Carpenter

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Washington . . . .

L. W. MOFFETT

• Materials of all kinds to undergo atomic bomb test at Bikini Atoll . . . Significance for industry as well as national defense awaited.

WASHINGTON — Crammed with hundreds of different items, the ships awaiting the atomic bomb test at Bikini Atoll have been transformed into the most extensive industrial testing laboratories of modern times.

Not content with learning the effect of atomic energy on ships and their structural makeup, the Army and Navy have loaded the decks of the 74 ships assigned to "Operation Crossroads" with everything from coal to experimental textiles and cans of beans to heavy motor vehicles and artillery. Even birds and beasts are to be sacrificed to progress.

With one experiment, knowledge never before available to industry will be gleaned to provide better products of the future. Steel, machinery, food, instruments, clothing, fuels, containers and countless other items will be subjected to the blast.

The background surrounding the decision of the armed forces to test all standard items of military equipment, as well as many experimental products, goes back to the development of the atom bomb.

The developmental work by "Manhattan Project" provided some knowledge concerning the effects of atomic energy on specific materials. Additional material was picked up as a result of the bombs dropped on Hiroshima and Nagasaki. But nothing that could be applied scientifically to future research and development of specified end-products and some raw materials was made available.

Many great unknowns remained. The tests at Bikini present the first opportunity for the world to learn the effects of atomic energy on specified materials — physically, chemically and structurally.

All the material will be completely inspected before the bomb is dropped to assure A-1 condition. Everything will be studied after the test by the nation's best scientific and technical talent, civilian and government, to determine the effect of the bomb burst, heat, pressure, radiation and mechanical shock.

This knowledge will prove invaluable to the armed services in the development of future military equipment and stores. With atomic energy looming greater and greater as a force to ease man's burdens, industry will undoubtedly make wide use of this information to reach important conclusions which will have a bearing on specifications for items now in development stages.

Many weeks would be required to compile a complete list of all the material placed aboard the ships and many pages would be necessary to reproduce the list. All of American industry is represented in the selections.

The Army was given space aboard four of the ships, the *Nevada, Arkansas, Pennsylvania* and *Saratoga,* for testing of ordnance items. Each of these contains a duplicate set of items including jeeps, ducks, trucks, guns, fire control equipment, ammunition and representative selections of all ordnance material.

For example, one of the ordnance items, the M7A1 generator unit with trailer, will be running when the bomb is dropped. This unit operates the M9A1 director with trailer which in turn controls the 90 mm anti-aircraft gun.

VARIOUS types of rubber and plastic were shipped to Bikini months ago and have been placed aboard still other ships.

A representative group of fuels and lubricants were included in Quartermaster items — gasoline, kerosene, oils, grease, diesel oil and industrial fuels. All of these will be tested in cans and drums, since the effect on containers is equally important.

Three types of coal, anthracite, bituminous, and one described as between the other two, will be exposed to the blast. Pure hydrocarbons are also included.

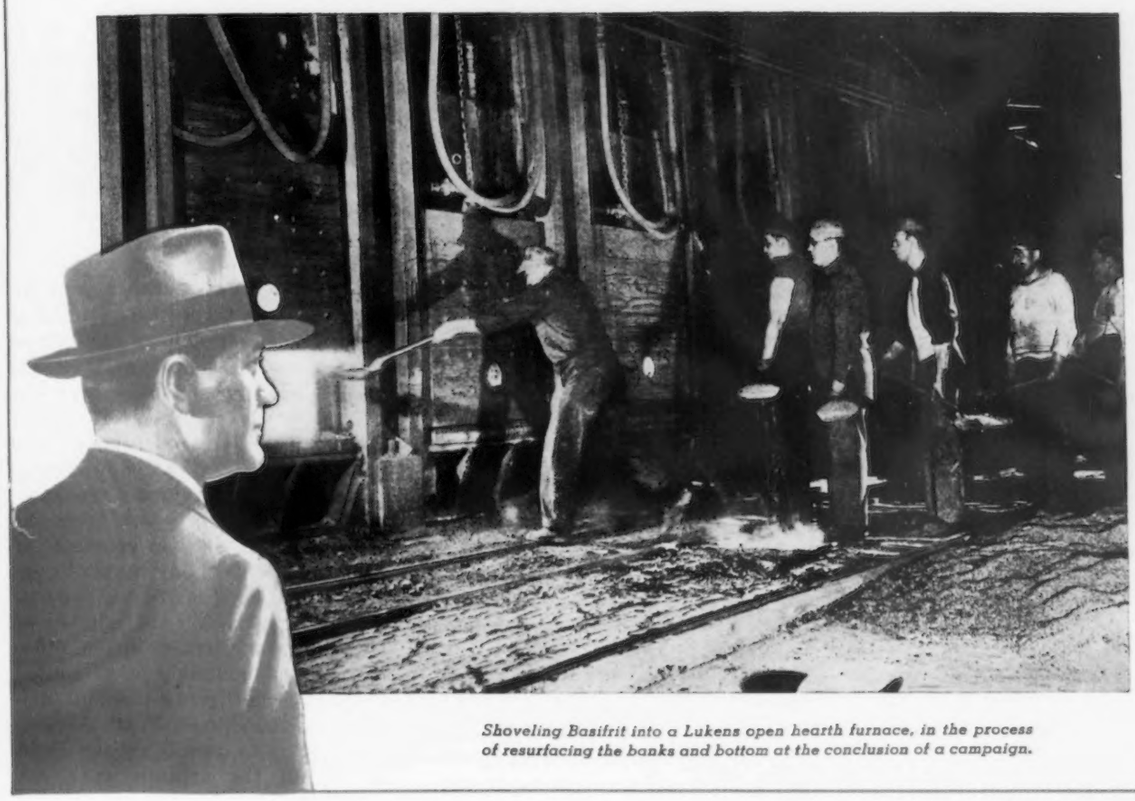
Samples of the fuels and lubricats have been retained in the United States and comparative studies will be made. The coal will be taken off the ships after the first test, if possible, and duplicate batches placed aboard for the second test.

Pumps, dispensers, pails, collapsible containers, pipe and pipe couplings were shipped along with the fuels and lubricants.

Clothing, footwear, food, canteens, tents, scabbards, rifle covers, cooking kits, stoves and ranges, field packs, belting, blankets, sleeping bags, desks and safes (with documents inside), repellents and insecticides, soaps, vitamin tablets, flameproofed fabrics, saran, doron, nylon, and so on into an almost endless list. It is difficult to see how anything necessary to modern living has been overlooked.

The material will be distributed throughout the ships. The ships have been arranged so that equipment will sustain varying degrees of damage. Some of the material will be on ships directly on the point of aim, while other quantities will be several thousand yards away.

All the material will be on deck and secured, since it is likely that the blast would otherwise blow much of it miles away. Below deck



Shoveling Basifrit into a Lukens open hearth furnace, in the process of resurfacing the banks and bottom at the conclusion of a campaign.

HOW LUKENS CUT OPEN HEARTH DELAY TIME

IN the past three years, Lukens Steel Company, through a planned program, has appreciably reduced lost time in its Open Hearth Department. Its program for reducing delay time and lowering refractory costs has saved the company thousands of dollars.

Among other things it is now standard practice at Lukens, at the end of a campaign, to wash down the furnace hearth and then resurface with a refractory material which includes a quick-setting magnesite of the Basifrit-type. Thus each new campaign starts with a clean, solid bottom on which delay time is nil.

These fundamentals are followed in heat-to-heat maintenance: Banks and ends are made up as the heat goes into the ladle. Ends are kept high to insure complete bottom drainage. Very little spar is used. If a deep bottom hole develops, it is repaired with Hearth Patch. Thirty minutes are allowed for fettling and chilling the hearth before charging. Finally, systematic records are kept, to permit analysis of bottom delays, check results of procedures, and plot further improvement.

In working out its maintenance program, Lukens invited the suggestions of Basic Refractories Engineers, who welcomed such an opportunity to collaborate. The services of these men are always available for a discussion of refractory problems—and their practical recommendations are made without charge.

BASIC REFRACTORIES, INCORPORATED

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conditions will be simulated in some cases. None of it will be on the islands.

Vehicles, wheeled equipment and other items will be outfitted for amphibious operation and will receive standard combat treatment including waterproofing.

Some of the material will be packaged, for the importance of proper packaging cannot be minimized. The direction of the blast will also be studied carefully in regard to packaged and palletized loads to determine the necessary steps for future development of packaging and storage. It may well be that as a result of the test new packaging methods will have to be developed using materials such as spun glass, plastic and new alloys.

Maritime Commission observers will be on hand to assess the degree of damage sustained by the hull and machinery of merchant-type vessels. They will also study the structural behavior of all-welded vessels in comparison to partially welded vessels.

Cameras and other scientific instruments will record some of the results. Others will be determined from direct inspection.

As soon after the test as it becomes safe to enter the area, an on-the-spot inspection will be made. The material will then be shipped to the United States for detailed study—vehicles to Aberdeen Proving Ground, watches and optical goods to Frankford Arsenal, coal to the Bureau of Mines, etc.

The results are obviously unknown, but possibilities are unlimited. Should any of the items retain radiation for an indefinite period, a segment of industry might be revolutionized.

LAGGING production and a thoroughly muddled state of affairs in the automotive parts industry has OPA experts frantically seeking ways and means of clearing up a situation which the price agency itself has described as "intolerable." Aside from strikes (within the parts plants) which hit production of new and replacement parts alike, the crux of the situation appears to hinge on insistence of OPA in keeping the industry on a "half-slave, half-free" basis—that is, maintaining ceilings on replacement parts while suspending controls on parts for new equipment.

OPA has offered a 12½ pct across-the-board increase to the industry in an effort to boost output of replacement parts. This is generally regarded as little incentive to producers to divert any appreciable amount of their facilities to turning out the more costly short-run parts under strict pricing regulation in view of the vast demand for decontrolled long-run parts for new equipment.

FOREIGN governments are stepping into the picture to rescue from the scrap pile a number of narrow-gage locomotives built for use of our armed forces overseas. The war ended, however, before many of these were shipped. Recently, the Brazilian Government acquired four to augment transportation of manganese ore from the interior and the Government of Siam took 18 off our hands to expedite movement of its rice exports. This brought to 58 the number of surplus locomotives exported, other purchasers including the United Fruit Co., the French Colonial Mission, and the French North African Mission. Sales usually return about 50 pct of the original cost, not counting that of many months of storage.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

HE'S MAKIN' TH' REST OF TH' SHOP THINK HE'S TELLIN' TH' BULL O' TH' WOODS WHERE TO GET OFF, AN' HE AIN'T SAYIN' A WORD! HE KNOWS WE COULDN'T HEAR IT ANYWAY, WITH TH' ROARIN' MACHINES!
'MINDS ME OF TH' DRIVER WHO'S ALWAYS BAWLIN' OUT TH' CAR THAT JUST PASSED-- SO THEM IN HIS CAR'LL THINK HE'S TOUGH-- AN' IF TH' GUY DID STOP AN' COME BACK HE'D FAINT!
J.R.WILLIAMS 6-21
THE FOUR-FLUSHER
COPR. 1946 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.

Give Amount of Steel Needed Per Vehicle

Washington

• • • **Estimates of steel** requirements per unit of farm machinery, victory design freight cars and automotive vehicles have just been published by the Bureau of Census. The figures on farm machinery and freight cars were taken from WPB records and those for automotive vehicles were prepared by OPM, WPB's predecessor.

Estimated carbon steel requirements per unit for 250 items of farm machinery ranged from 3 lb for hand seeders to 6600 lb for 15 ft cut harvesting machinery.

For the 19 victory design freight cars, exclusive of wheels, steel requirements varied from 31,400 lb for a 50-ton box car to 53,100 lb for a 70-ton gondola. The largest single item in any of these cars was 27,348 lb of plates for the 70-ton gondola with a steel floor.

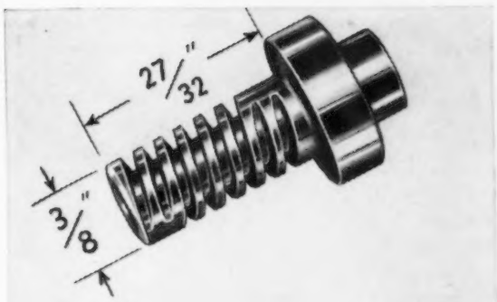
Over 3850 lb of iron and steel went into a 1942 model passenger automobile. Steel requirements for trucks ranged from 3870 lb for light units to 12,890 lb for "heavy-heavy" trucks.

SHEFFIELD MACHINE TOOL DATA

TFG #121

CRUSH GRINDING MULTIPLE START WORMS

ON SHEFFIELD PRECISION THREAD AND FORM GRINDER



BRONZE WORM FOR SPEED REDUCTION
32 D.P. — 14½° P.A. — 2 THD. L.H.
PLUNGE GRIND IN 35 SECONDS

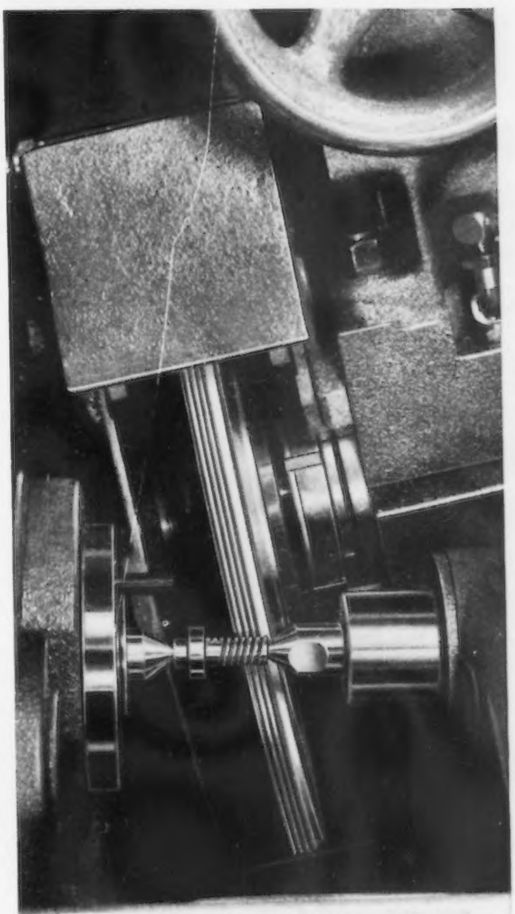
Multiple or single start worms can be quickly and economically produced by Crush Grinding with a Multi-Rib wheel.

Evidence substantiating this statement is incorporated in the following case history.

The part illustrated is a double start 32 diametral pitch worm with conventional 14½° pressure angle. Material is bronze. P.D. tolerance is to be held to .003 over wires. As practically all worms have clearance between the root and the mating worm wheel, a radius at the root presents no problem in assembly.

The multi-rib wheel, crush trued, was set at the required helix angle, 11° 26'. The wheel was briskly plunged to depth inside the outer center of the part so as not to cut through the thrust face. The cut was stopped close to the shoulder of the gear diameter to prevent the wheel marking the shoulder.

The grinding time of 35 seconds produced both starts simultaneously. Burrs usually produced in conventional thread milling are eliminated by crush grinding.



MACHINE SETUP TO GRIND DOUBLE START LEFT HAND WORM WITH CRUSH TRUED MULTIRIB WHEEL. HELIX ANGLE 11° 26'

In the majority of cases, crush plunge grinding of threads or forms will reduce substantially your present manufacturing costs. Write for Bulletins M-100-145 and M-120-144.

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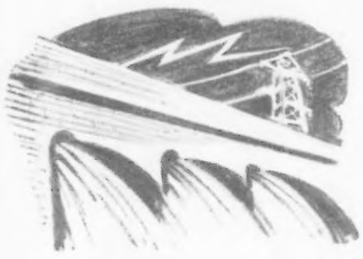
West Coast . . .

ROBERT T. REINHARDT

• Copper strike can sabotage industry, says G.E. official . . . Phantom freight assailed by Los Angeles industrial leader . . . Large pipe line contract to Consolidated Steel Corp. . . . Seattle steel plant plans development.



SAN FRANCISCO — Atomic power for industry may be in the offing—far in the offing to be sure—but of more immediate importance to the general public and manufacturers is the acute copper shortage, according to Ralph J. Cordiner, General Electric Co. vice-president, who should know whereof he speaks since his company is soon to take over the Hanford project and is also the nation's largest user of copper.

On a flying trip to the West Coast for the purpose of inspecting the atomic energy plant at Hanford, Washington, which GE is to operate under contract with the War Dept. at $1 per year profit, Mr. Cordiner took opportunity to lambast the OPA for allowing only an approximate increase of 25 pct in the price of copper when wages and other costs have risen more than 40 pct. "The strike in the copper mines has been going on for more than four months and unless it is settled immediately, all production of motor driven equipment must stop within 30 or 40 days," he told the press. "It is my opinion that the public would be quite willing to pay a few cents more for a refrigerator or vacuum cleaner than to continue to be without, and that is the only increase which would be involved if a fair price were allowed the mine operators for their copper," he added.

Bay Area appliance dealers verified Mr. Cordiner's opinion and manufacturers who have had motors on order for months gave endorsement to the contention that a modest price increase would be welcome if it would facilitate delivery of critical units.

Information from Utah indicates that progress toward settlement of the copper strike is being made although it is conceded that a more substantial price increase would have paved the way for more rapid agreement. While the hourly wage increase is not expected to prove a stumbling block, since apparently the 18½¢ pattern has been well established the matter of union security still poses problems. It is possible, according to observers, that the common labor adjustment from $6.15 for track workers and $6.45 for smelter laborers to a minimum of $6.70 may prove a stickler. Such an adjustment, it is pointed out, would necessitate relatively small increases on up the line to keep classifications from bumping. The Utah Copper Co. mine is reported as the only operator using the $6.15 track worker rate.

Present shortages are not deterring General Electric from continuing its expansion program in the Bay Area. Mr. Cordiner stated that the present lamp works in Oakland would soon double its output, an electrical cable plant in East Oakland will soon be in production, the engineering is complete for a new plant at San Jose, Calif., and the apparatus plant in Oakland is doubling its capacity. The expanded industry will employ approximately 2500.

On the subject of atomic energy for industry, Mr. Cordiner was reluctant to speak except to say GE would continue research, but such research would be independent of its operation of the Hanford plant for the War Dept.

ANOTHER Bay Area visitor, James F. Bone, industrial manager of the Los Angeles Chamber of Commerce offered a few suggestions for improving the industrial situation in the West in an address before the Pacific Coast Electrical Assn.

Condemning phantom freight on steel, Mr. Bone, who is also secretary of the Steel Committee of the Western States Council, said: "Under this policy, western manufacturers who buy steel pay a base price, plus the combination rail and water freight charges from the East Coast to the West Coast on basic steel shapes actually produced here in the West. This, of course, limits the market area in which our finished products can be sold. Western industry is now entitled to a western price on steel produced in the West." He also urged railroads to eliminate the "prevailing differential in freight rates on manufactured goods favoring the westbound shipper as against the eastbound shipper."

In addition to phantom freight and unbalanced shipping costs, Mr. Bone cited the following obstacles in the path toward complete industrialization of the West: Lack of intermediate industries; need for development of new domestic and export markets; scarcity of land properly zoned for industry; inadequacy of industrial waste disposal systems; shortages of water and gas in some areas; improper control of industrial smoke and fumes which antagonizes the public.

LOS ANGELES — Consolidated Steel Corp. will start fabrication in September of 214 miles of 30-in. automatically welded steel pipe for a part of the 1280-mile, $70 million line which is to bring gas from Texas and New Mexico to southern California. The only contingency in start of operations is the availability of the 58,000 tons of 9/32 in. and ⅜-in. plate which is being supplied by U. S. Steel Corp. and Bethlehem Steel Co. The contract for the 214 miles of pipe approximates $6 million.

The Southern California Gas Co. and the Southern Counties Gas Co. will install the 214-mile section between the Arizona-California border and Santa Fe Springs, Calif. The balance of the line which includes 251 miles of 24-in. pipe from Dumas Tex., to the Eunice, N. M.,

Braze it for 4¢ with TOCCO

Willey's Carbide Tool Company, Detroit, reports the following benefits from TOCCO *Induction Brazing* of tool tips:

1. ***Large lathe tools:*** **8 times as fast.** ***TOCCO brazes 85 per hour; former method 80 per day.***
2. **Cost cut from 58¢ to 4¢** ***for each large tool.***
3. ***Small tools (¾" to ¼" square):*** **TOCCO brazes 250 to 400 per hour.**
4. ***Two 15-KW TOCCO machines*** **paid for themselves in three months.**

Mail coupon for information on New Low Cost TOCCO 7½ KW machine . . . ideal for brazing and other heating applications.

THE OHIO CRANKSHAFT COMPANY

TOCCO

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THE OHIO CRANKSHAFT CO.
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Send Bul. 16 on New Low Cost TOCCO 7½ KW machine for brazing and other heating applications.

Name.....
Position .....
Company.....
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City .....Zone... State.....

plant of the El Paso Natural Gas Co. which will supply the gas, and 737 miles of 26-in. line from Lea County, Tex., to a point near Blythe, Calif., will be constructed by the El Paso company, it has been announced.

Withholding of large amounts of natural gas by the oil companies in order to maintain pressures underground and increase future oil recoveries plus the increased demand for fuel, has made the importation of gas imperative, it is stated. The two local gas companies do not own natural gas producing properties and have been depending on oil producers for their supply. A substantial part of the gas to be carried in the new line, which is expected to be completed during the winter of 1947-48, would otherwise be wasted because of a lack of market near its source.

* * *

Foundries here will have a local source of brass and bronze ingots as soon as a smelter now under construction by H. Kramer & Co. is completed. Large producers of ingot brass in the Chicago area, this company expects to furnish material to producers of faucets, valves, hardware, bushings, bearings, gears and many forms of building supplies. Plant and equipment is expected to cost approximately $500,000 and is to be located in the central manufacturing district. Model equipment is to include control of all smoke and fumes by installation of bag houses. H. E. McGowan, who will be sales manager of the plant, estimates 150 persons will be employed.

* * *

Snyder Engineering Co. of this city has designed and installed Jeffrey mechanical sand handling equipment for Price-Pfister Mfg. Co. to increase production of plumbing fixtures which are in heavy demand. With the new system the sand is conveyed under the floor from the mold shakeout stations to central reconditioning plant and redistributed overhead to the molding stations. A unique feature of the system is the arrangement for loading the mixer automatically.

The company produces sink spouts, shower valve heads, globe and angle valves and plumbing trim. Isidor Familian is general manager.

* * *

"Hercules," the $20 million flying boat built by Howard Hughes, has gone down to the sea for assembly and test flight. Each wing, 191 ft long, 49 ft wide at the root, 19 ft high and weighing 82,000 lbs was moved separately from Culver City to Long Beach on house movers' dollies. The 122,000 lb fuselage made another load. Under construction at the Hughes Aircraft Co. plant since March 1943, it cost approximately $140,000 to move the eight-engined, plywood plane to its proposed launching site.

Although assembly will be complete in about three or four months, it is believed the plane may not be ready for flight until early next year. Constructed as an experimental plane for the Army, the H-4, as it is officially known, is the largest plane in the world. Its hull is 220 ft long, 25 ft wide, 30 ft high. Wing tip to wing tip measurement is 320 ft. Powered by its eight 3000 hp engines, the plane is expected to fly 218 mph carrying 42 tons of fuel. Weighing 200 tons, the net cargo capacity will be 60 tons or the equivalent of about two railroad box cars.

SEATTLE—Further information released on the proposed new steel mill to be built in this area reveals that contrary to the first announcement, ingot production from scrap is contemplated. The operation financed by the Seidelhuber family which owns the Seidelhuber Iron & Bronze Works, is scheduled for operation late in 1947 and is to employ 800 persons according to company spokesmen.

According to the promoters of the project, they are assuming that the annual demand for sheets on the West Coast is approximately 700,000 tons and that only about 150,000 tons are being received from eastern mills. They maintain that at the present time only two eastern mills are shipping sheet steel to the West Coast and that Columbia Steel Co.'s plants at Pittsburgh and Torrance, Calif., are the only producers on the Coast.

Well-informed industrialists point out that the 700,000 ton figure may be a bit high and that there is an excellent chance that before the Seidelhubers can get their plant into operation, the West Coast will have abundant sheet supply from the cold-rolling facilities being put in at Pittsburgh, Calif., by Columbia Steel Co.; from the Sparrows Point mills of Bethlehem Steel Co.; from the hot mills of Columbia at Torrance, Calif.; possibly from the O'Keefe & Merritt proposed plant at Los Angeles; and narrow strip from the Kaiser plant at Fontana, Calif.

Officers of the Seidelhuber Iron & Bronze Works are: Frank V. Seidelhuber, president; Frank V. Seidelhuber, Jr., operations manager; Frank L. Cassidy, sales manager and vice-president; and W. T. Williams, purchasing agent. Roy Erickson is also a member of the administrative staff.

Industrial Disarmament Group Asks 50 Pct Cut In Jap Machine Tools

Washington

• • • **Under the industrial** disarmanent program recommended to the State, War and Navy Departments, all machine tools in Japanese war plants, arsenals and aircraft factories would be eliminated, amounting to an overall reduction of 50 pct in the machine tool industry.

This is the substance of the report and recommendation made by the National Engineers Committee, appointed in 1945 to study industrial disarmament of warring nations, as it applies to machine tools.

According to the inventory figures obtained by the committee, at the close of the war there were 77,939 machine tools in operative condition in the arsenals of Japan. In the aircraft industry, it was estimated that there were about 400,000 more. When these are added to those in the so-called civilian industries, the total amounts to something more than 1,000,000.

On the basis of preliminary surveys, it was estimated that the elimination of tools in the arsenals, aircraft plants and industrial establishments which functioned mainly in producing war materials would account for as many as a half-million now existing.

The present potential capacity for the production of machine tools by Japan is placed at a little more than 20,000 units a year. Production is centered in some 20 companies of which five predominate.

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European Letter . . .

JACK R. HIGHT

• Further details of nationalization are revealed . . . Foundries may be excepted . . . Method of payment in doubt . . . Ford plant poses problem.

LONDON—More of the Minister of Supply's ideas about nationalizing the British iron and steel industry came out in a press conference held recently for American correspondents, and even more interesting details were hinted. It appears now that the steel foundries will be the only section of the industry specially omitted from the nationalization plan.

It seems likely that the proposed review of finishing firms, section by section and firm by firm, will tend to lean in the direction of nationalizing everything that is in doubt, if today's thinking prevails. Thus the current notion is that it will be easier to take over all of any firm that is a borderline case, and then to cast off the parts that are out of the line.

Interesting development in this line will be the ultimate future of the Ford Motor Co. works at Dagenham, just outside London. It may be that even the Minister himself does not grasp exactly the perplexing problem that he has before himself at this plant. The local Ford plant is in most ways a typical vertically complete structure of the Rouge type, on a smaller scale. The plant is somewhat out of balance, however, in that blast furnace capacity was expanded in the thirties, anticipating further development of manufacturing facilities, but due to changes in marketing conditions in Europe, the projected expansion of motor car production never materialized.

Ford has thus been selling more of its pig iron production from Dagenham than it has been using. But the blast furnace plant is a part of the integral whole that is the Dagenham works. The government has stated flatly that the policy will be to take over all blast furnaces, and has also said that where finishing operations are integrated the whole works will be taken over. Thus we see the government going into the automobile business, a position that I doubt if Mr. Wilmot is prepared to defend at the present moment.

THE steps in taking over such an industry will of course be complex, and there will be other problems even more perplexing than the Ford situation. Current poser for the government steel experts is the method of compensation to be applied for the acquisition of the steel shares. Two favored methods at this writing are on the basis of a net maintainable revenue, or on the market value of the shares. The government would probably prefer the first, except for the complexities of intertwining the nationalization program with a broad modernization plan for the industry. Thus the investment of large sums in new mills, and the economic necessity for eventually scrapping many existing facilities would make a precise determination of net maintainable revenue very difficult. On the other hand, the Minister probably recognizes the fact that market value of the shares tends to reflect management's liberality with dividends, rather than the true productive worth of a particular company.

The Minister has before himself next the prime job of selecting a chairman of the interim steel board. He has deliberately refrained from making any selection until after obtaining his vote of confidence in the form of the approval after the recent House of Commons debate on the issue. Now he cannot very well make any further decision as to the details of the plan until he has a chairman of the board. The appointment will be a key one, as the Minister is well aware. He will be negotiating with the steel industry in the personification of Sir Andrew Duncan. The appointment of Sir Andrew to the post as independent chairman of the British Iron and Steel Federation in the thirties was guided by an urgent need to obtain the services of a strong personality to guide the policies of the strong personalities heading the steel firms themselves. Duncan has filled the bill superbly.

In carrying out the death sentence on the Federation, across a conference table from Sir Andrew, there must be an executive of the first water, an even stronger personality if he can be found, for it will be a case of run the show or be run.

THE board itself will be a small one, probably five members or possibly six. Besides the chairman there will be a financial-legal expert, labor representation, and industry representation. Despite earlier reports, it seems likely that the Minister did not actually approach anyone for positions on the board before the debate. He would hardly deny, however, that he does have certain tentative choices made in his own mind.

Official opinion is that the interim board will function for possibly 18 months to two years. Ministry of Supply officials seem not to expect the presentation of any legislation for the nationalization for 18 months, and it is doubtful if action could be completed for another six months after that. The permanent steel board which will be introduced in the permanent plan (a board has only been tacitly, not specifically, admitted to date) may well be a somewhat larger organization than the 5-man interim hierarchy. The later group will probably be organized on a regional basis, and will certainly have to be large enough to keep directly in touch with the industry.

Mr. Wilmot took issue at the press conference with Sir Andrew's House of Commons statement that only five or six of the largest companies know where they stand

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after the broad announcement of the scope of nationalization. There is certainly plenty of room for quibbling on this point, but at least in the minds of the Labor government the fate of most of the firms is in fact resolved. In the first place, as previously reported, the iron ore industry, pig iron production, and steel ingot production are definitely "in." Although not yet announced and not irrevocably decided, steel foundries are probably out, certainly so in today's thinking. Small jobbing foundries in iron will not be included, nor will foundries connected with the manufacturing plants. Spun pipe production (nearly a monopoly in England) will be taken over. The large number of independent re-rollers will in most cases be outside the scope of the plan, with the possible exception of two or three of the largest.

IT is in the application of the above criteria that the interim board will enjoy some of its liveliest sessions. The position is somewhat different from what the Minister outlined in April when he first discussed the appointment of such a board. His statement at that time was that the definition of the scope of nationalization would be left to the board, while in fact most of this work is now already cut out for them.

The initial stages of the development of the modernization plan for the industry as set forth by the British Iron and Steel Federation have already been approved, with most of the large plans clear for one or two years' work. Thus, although the final determination of where the continuous strip mill for South Wales will be purchased awaits the outcome of the loan negotiations, the site preparation is already well under way. The situation is somewhat similar in regard to the broad flange beam mill for the North of England.

There seems to be only a dim future for small business in the iron and steel industry of tomorrow in the U.K. Reluctantly the officials involved can see no bright star to which the independent reroller or individual producer of any kind may cling. Probably he will be left outside when the nationalization gets under way. He will operate then only on the whim of the government. He will be forced to depend for his materials on a large integrated government combine with which he will also be in competition. Regardless of whether he happens to be an efficient or a non-efficient producer, the long term view is that he will get in the government industry's hair, and be driven out of the field or swallowed up.

This grim future is in contrast to the situation today, when the government's iron and steel control is forcing a flow of materials to the smaller firms because their production is needed.

BIRMINGHAM, ENGLAND—The drive to get into production on peacetime lines with all of the prewar attention to costs is forcing some companies to revise their previous estimates of the ultimate benefits of wartime technical achievements. One large producer here who developed a number of widespread applications for negative rake milling has now completed a series of time and cost studies that dictate caution in applying negative rake to peacetime lines.

The wartime abandon that permitted any sacrifice to sheer speed of production is now giving way to a more measured caution. Considerations of machine life, maintenance expenses, and the utilization of existing equipment to the fullest extent is producing some new answers that supplement the flattering comparisons of feeds and speeds.

Local firms are currently branching out into the production of bench tools for their own use to relieve shortages. Small bench presses are among the items being built by one firm to step up reconversion without awaiting deliveries from the outside.

U.S. to Investigate The German Methods Of Producing Cerium

Washington

• • • **Formation of an** investigating team to study German production and use of heatresistant cerium alloys and other forms of of the rare earth metal was announced recently by the Technical Industrial Intelligence Branch, Department of Commerce.

The members of the team are John A. Livingston of Pelham Manor, N. Y., president of the Cerium Metals Corp., New York, and Henry Kent, partner in the Kent Metal & Chemical Works, Edgewater, N. J. Mr. Livingston is scheduled to leave for Germany on June 11, 1946, and Mr. Kent will join him in a few weeks. The investigators' expenses will be borne by their companies.

Since cerium combines very readily with many other elements, it is extremely difficult to handle. Earlier studies by TIIB investigators indicated that the Germans had made considerable progress in the use of cerium before their supplies were cut off during the war.

According to Mr. Livingston, German engineers have achieved 20 pct higher extraction of the metal from monazite sand than is possible with methods now known in the United States. They have also developed techniques for working cerium in powder form.

The chief uses of cerium are: (1) To produce steel alloys and aluminum and magnesium alloy castings for jet-plane gas-turbines, aircraft supercharger parts, and other equipment demanding great tensile strength at high temperature; (2) to produce a vacuum in electronic tubes by absorbing the oxygen remaining in the glass when it is sealed; and (3) as an igniter in torches for acetylene welding, in cigarette lighter flints, and in miners' head lamps.

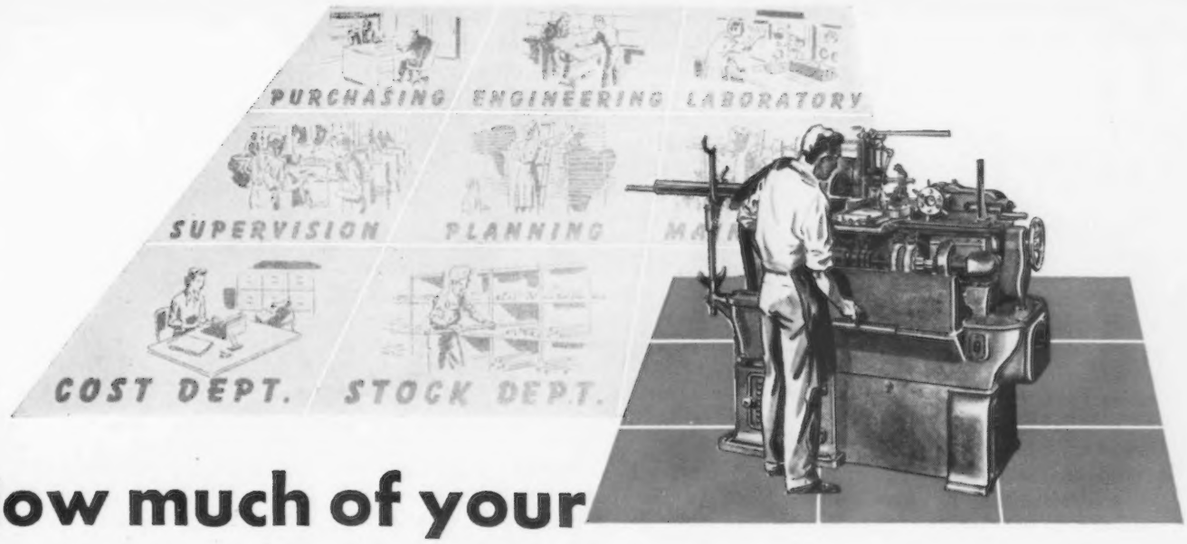
The investigators' report will be made public through the Office of the Publication Board, Dept. of Commerce.

Output of French Castings

Paris

• • • **French integrated** iron and steel foundries produced during February last 50,490 tons of castings against 81,400 tons per month in 1938. The nonintegrated iron and steel foundries have produced in the same period 9020 tons against 22,000 tons per month in 1938. The integrated foundries have had an advantage over the nonintegrated regarding allocations of raw materials.

There are in France about 1850 foundries, 750 of which are iron and steel, and the number of workers employed total 55,000.



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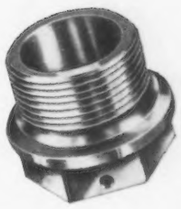

Figure it out: Suppose you need some special part for your assemblies. You have a few automatics and the men to run them, so you make the parts. Your Purchasing Agent buys the bars — Engineering lays out the detail — Laboratory tests samples of stock and output — Supervision sets up the jobs — Planning schedules them — Maintenance keeps things running — Cost Dept. makes special entries — Stock Dept. has raw material as well as finished product to keep track of — and your too-busy Tool Room has extra work to do!

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PERSONALS

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• **R. N. Landreth**, assistant to the vice-president, General Machinery Div. of the Allis-Chalmers Mfg. Co., Milwaukee, has been named to direct the activities of the company's Washington district office in addition to his other special duties. Mr. Landreth, who joined the company in 1931, was transferred to Washington in 1934 and served as district manager there until 1944 when he was named special representative. In 1945 he became assistant to the vice-president with offices in Washington. **Ralph R. Newquist** has resigned as manager of Allis-Chalmers Washington district office to accept a position in charge of sales for a mid-western concern.

• **I. C. Ebeling** has been appointed Detroit district manager of Geary Stainless Steel Co. of Baltimore, to handle sales of stainless products in all forms. He was formerly with Ford Motor Co. and G. S. Cochrane.

• **Dr. R. M. Reichl** has been promoted to the position of vice-president of Hydropress, Inc. of New York. He represented Hydropress, Inc. as consulting engineer in many new developments for our Army, Navy and Air Forces.

DR. R. M. REICHL, vice-president, Hydropress, Inc.

• **Robert J. McGreevy** has been appointed by the Philadelphia Div. of the Yale & Towne Mfg. Co. as assistant district manager of industrial truck sales—engineering for the metropolitan New York City area with offices in New York. Mr. McGreevy joined Yale & Towne in 1940 in the Pittsburgh office, was transferred immediately after the Pearl Harbor attack to Washington as industrial engineer to supervise distribution of materials handling equipment to the armed forces, and joined the Navy in 1943.

• **Walter F. Cahill** has been elected to the board of directors of Lincoln Park Industries, Lincoln Park, Mich. He heads the Walter F. Cahill Co.

• **George A. Rentschler** has retired as president of the General Machinery Corp., Hamilton, Ohio, and has been elected to the new office of chairman of the board. **Walter Rentschler**, vice-president and treasurer, has been elected president. **J. E. Peterson** has been named second vice-president and **A. C. Wais**, who has been a director, has been made vice-president in charge of manufacturing.

• **Walker Penfield** has been named manager of manufacturing of the Pennsylvania Salt Mfg. Co., Philadelphia. Mr. Penfield formerly was works manager, a position discontinued in a reorganization of Pennsalt's mfg. dept. **Claude S. Beldin**, regional superintendent, has been appointed to the newly created position of production manager. **Henry G. Meyer**, formerly assistant to the works manager, has been named assistant to the production manager, and **Russell E. Cushing**, director of chemical engineering, now reports to W. F. Mitchell, superintendent of the Wyandotte, Mich. plant.

• **Wilbur C. Thompson** has been appointed general sales manager of the Detroit Ball Bearing Co. of Michigan and the Detroit Ball Bearing Co. of Ohio.

• **B. C. O'Brien** has been elected president and general manager of the Bury Compressor Co. of Erie, Pa. Prior to joining Bury Compressor, he was associated for a number of years with the Roots-Connersville Blower Corp. where he was vice-president and sales manager.

A. C. CURRAN, general purchasing agent, American Chain & Cable Co., Inc. and associate companies.

• **A. C. Curran** has been appointed general purchasing agent of American Chain & Cable Co., Inc. and associate companies, with headquarters at the executive offices in Bridgeport, Conn. Mr. Curran has been with the company since 1914 and has been continuously in the general purchase dept., having been assistant general purchasing agent for the past several years.

• **Edwin M. Allen** has retired from his post as chairman of the board of the Mathieson Alkali Works, New York, but will continue as a director of the company. He joined the Mathieson organization as president in 1919.

• **Morris Podolsky** has been appointed supervisor of warehouse operations for Levinson Steel Co., Pittsburgh. **Nicholas Pesanka** succeeds him in his former position as supervisor of the fabricating dept. **Abe Margolis**, returning from the armed forces, has been appointed plant office manager. **Sidney Moidel** has been appointed office manager of the special dept. **Benjamin Moss**, formerly with Reliance Steel Products Co., has joined the company's sales dept., and **Jerome Goldman**, returned recently from the armed forces, has been appointed office manager of the warehouse dept.

• **C. H. R. MacKenzie**, district manager of the Detroit office, has been elected vice-president and director of Luria Steel & Trading Corp.

DAVID M. HALLIER, sales manager, National Tool Co.

• **David M. Hallier** has been appointed sales manager of National Tool Co., Cleveland. Prior to his new appointment, he served as assistant sales manager of National Tool.

• **W. Luther Lewis**, who has been executive vice-president of the Chicago Pneumatic Tool Co., New York, since 1931, has been elected to succeed **H. A. Jackson** as president. Mr. Jackson, chairman of the board of directors for 14 yr, and president of the company for 28 yr, has been re-elected chairman of the board of directors. He has relinquished the position of president.

• **Charles E. Brinley** has been elected chairman of the board of the Baldwin Locomotive Works, Eddystone, Pa. **Ralph Kelly** has been elected president; **W. Horace Holcomb**, vice-president — industrial relations; **Charles E. Acker**, vice-president—corporate and financial, and secretary; **Lewis W. Metzger**, vice-president, operations—Eddystone Div.; **John D. Tyson**, divisional vice-president in charge of Standard Steel Works Div.; **Howard D. Humphreys**, treasurer and assistant secretary; and W. **Raymond Parshall**, comptroller. **R. Nevin Watt** has been appointed general manager of sales and **J. M. Sturges**, district manager of the Northeastern district of Baldwin Locomotive Works, with headquarters in New York.

• **George Hajek**, for 12 yr sales engineer for Ceco Steel Products Corp. at Chicago, has been appointed manager of the Dallas sales district. He replaces J. C. Boyce. **John W. Anderson**, until recently assistant manager of the Birmingham office of Ceco, has been appointed manager of the firm's Oklahoma City sales district. He replaces **R. K. Alexander**, who has been placed in charge of the sales office and warehouse in Houston.

• **Howard S. Bowen** has been appointed sales engineer in the Chicago district of Aluminum Industries, Inc., Cincinnati. Before he served in the Navy, Mr. Bowen was associated with the Goodyear Aircraft Corp.

• **C. V. Gregory** has been appointed district manager in Pittsburgh for Reliance Electric & Engineering Co., Cleveland, succeeding **Bon J. Ballard**, who becomes assistant to the sales vice-president. Mr. Ballard will continue to make his headquarters in Pittsburgh. **L. J. Carr**, who prior to 2½ yr in the U. S. Naval Reserve, was a sales engineer in Reliance's Chicago office, will join the Reliance staff in Pittsburgh.

• **Clifford W. Sponsel** has been appointed general manager of Brooks & Perkins, Detroit. In this capacity, he will be in charge of manufacturing, sales, engineering, employment, and related functions. He had formerly been with the Ryan Aeronautical Co.

• **W. Fields De Groat** has been appointed chief engineer of Kellett Aircraft Corp., North Wales, Pa., to assume responsibility for the company's helicopter design activities. He joined Kellett in 1945 as chief research and development engineer, and now succeeds **Richard H. Prewitt**, vice-president and chief engineer of Kellett for a number of years, who has resigned to establish a helicopter engineering consulting and research service.

• **Paul H. Winters** has been appointed chief engineer of the New York office of La Salle Engineering Co. Prior to joining La Salle, Mr. Winters was associated with the Heald Machine Co. of Worcester, Mass., for 4 yr.

• **Harry Costello** has become associated with Advance Pressure Castings, Inc., Brooklyn, in charge of their Estimating Div., as well as to head the planning board of their Selectively Processed Div.

• **Lew C. Davies** has been appointed exclusive representative in the Chicago territory for the Acme Machinery Div. of Hill Acme Co. For the past 25 yr, Mr. Davies has been superintendent of maintenance, tool and die dept., of the American Forge Div. of American Brake Shoe Co.

• **Harold C. Hickock** has been appointed central district manager of the B. F. Sturtevant Co., division of Westinghouse Electric Corp. with headquarters in Pittsburgh. He was central district manager of the Elevator Div. of Westinghouse. **Dallas W. Norris**, manager of the St. Louis district of the Elevator & Air Conditioning Div., has assumed the post vacated by Mr. Hickock.

• **Howard J. Mullin** has been appointed manager of sales for the St. Louis district, Carnegie-Illinois Steel Corp., succeeding **Robert J. Korsan, Jr.**, retired. Mr. Mullin became associated with Carnegie-Illinois in 1927. He held various sales positions in Milwaukee and Kansas City district sales offices and was made assistant sales manager of the St. Louis office Jan. 1 of this year, which position he held until his present appointment.

HOWARD J. MULLIN, manager of sales, St. Louis district, Carnegie-Illinois Steel Corp.

• **Mel B. Lindquist** of Ford Motor Co., Dearborn, Mich., has been promoted to assistant director of industrial relations. Mr. Lindquist will be succeeded as director of labor relations for Ford by **Manton M. Cummins,** who previously directed labor relations at the Willow Run bomber plant.

• **C. N. Bristol** has been appointed superintendent of the York, Pa., works of the General Electric Co.'s Wiring Device Div. Mr. Bristol began his association with the company in 1935 as an assembler in the Wiring Device Div. Prior to his present appointment he was general foreman of the York works.

• **William E. Rudel** has been appointed New England manager for Rudel Machinery Co., Inc., with headquarters at their office in Boston. **J. B. Riley** has also joined the company to handle the larger accounts in metropolitan Boston.

• **Dr. Sidney M. Cadwell,** formerly assistant general manager of the company's Tire Div. in Detroit, has been appointed director of research and technical development of the U. S. Rubber Co. Dr. Cadwell's headquarters will be in New York.

• **Paul E. McCracken** has been named general parts and accessory manager of the Buick Motor Div., General Motors Corp., Flint, Mich. **C. W. Jacobs,** formerly in charge of both parts and service, will become general service manager in charge of product service and dealer service promotion.

ALFRED B. DRASTRUP, manager, alloy steel sales dept. A. M. Byers Co.

• **Alfred B. Drastrup** has been appointed manager of the alloy steel sales dept. of A. M. Byers Co., Pittsburgh. Mr. Drastrup has been associated with A. M. Byers Co. since 1931 in accounting, industrial engineering and plant management capacities and previously was with the Columbia Steel Co., Torrence, Calif., and the Gary works of the U. S. Steel Corp., Gary, Ind.

• **Charles Harrison** has been made division manager in the western Michigan territory of the Aro Equipment Corp., with his headquarters in Lansing, Mich. He formerly was assistant in the Detroit and Michigan territory, under Mr. Charles Kocsis.

• **H. A. Klug** has been appointed merchandise manager and **J. B. Baughman,** product supervisor in the refrigeration specialties dept. at the East Springfield, Mass. works of the Westinghouse Electric Corp. Mr. Klug was formerly project manager of war plant construction for the Frank A. McBride Co., and spent 8 yr with the Refrigeration & Air Conditioning Div. of General Motors Corp. Mr. Baughman has been filling varied field and headquarters assignments in the refrigeration sales dept. of Westinghouse Electric for the past several years. **Dr. Stuart A. Good** has been named medical director of the Westinghouse Electric Corp.'s Motor Div. in Buffalo. He formerly was assistant to the chief surgeon of Bethlehem Steel and more recently was medical director of Curtiss-Wright plants in Buffalo. **Col. John A. Holman** has been appointed business director of stratovision, with his headquarters in Baltimore, and **Frederick P. Walter** has been made product supervisor, table appliance dept., Westinghouse Electric Appliance Div., Mansfield, Ohio.

• **Frank O. Jappel** has been named sales manager of Eclipse Counterbore Co., Detroit. He has been in the sales dept., handling the western Detroit and lower Michigan territory for the past 11 yr.

• **Dr. Edmund S. Rittner** has joined the research staff of Philips Laboratories, Inc., Irvington, N. Y., as associate chemist.

...OBITUARY...

• **Rudolph L. Suhl,** 64, manager of the nickel sales dept. of the International Nickel Co. at New York, died suddenly on June 10. Mr. Suhl had been associated with International Nickel for over 43 yr.

• **Eric E. Sommer,** 34, sales engineer with the Linde Air Products Co., New Products Div., New York, died June 5 as the result of the disastrous fire which swept the La Salle Hotel in Chicago.

• **Edgar L. Feininger,** 56, assistant general manager of the chemical dept. of the General Electric Co., Pittsfield, Mass., died suddenly while attending a company outing at Lake George.

• **Charles E. McManus,** chairman of the board, Crown Cork & Seal Co., Inc., Baltimore and Philadelphia, died June 3.

• **George B. Evans,** 65, plant manager of the Wagner Electric Corp., St. Louis, died suddenly on May 25 from a cerebral hemorrhage. He started to work with the Wagner Co. in 1904 as a tool and die maker, and rose through the ranks, becoming general superintendent in 1921. He held that position until last February, when he was named plant manager.

• **William S. McClintic,** 69, retired superintendent of the Keystone Works of Jones & Laughlin Steel Corp., Pittsburgh, died recently.

• **William J. Cleary,** purchasing director of the Briggs Mfg. Co., Detroit, died recently after a brief illness. Before joining Briggs, Mr. Cleary was associated with Wilson Foundry Co., Studebaker and Chrysler Corp.

• **Noel H. Hick,** 62, project engineer for the Austin Co., Cleveland, died May 24.

• **William O. Hall,** 56, purchasing agent for the Williamson Heater Co., Cincinnati, died recently.

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Scales • Motors • Pumps • Generators
Magnetos • Stokers • Railroad Motor
Cars and Standpipes • Farm Equipment

Dear Editor:

PRECISION CASTING PATENTS

Sir:

In your issue of May 23 we note there is reference in "Newsfront" to precision casting and a patent suit which resulted in a decision that the process is patentable. We are greatly interested in this and would appreciate it if you could furnish us with further information. . . .

F. S. MARTIN
Vice-President
Precision Metalsmiths, Inc.
Cleveland

● **The decision in the U. S. District Court for New Jersey, in the case of Ostby and Barton Co. v. Jungerson, would seem to make it clear that firms not using centrifugal casting methods in connection with the lost wax process do not infringe on the patents involved in the litigation. The decision was handed down by Judge T. F. Meaney on May 7.—Ed.**

STEEL MANUFACTURERS

Sir:

Please advise if you print a directory listing the names of companies that manufacture steel; also a directory of steel warehouses in the midwest area.

E. G. TIDWELL
Cherokee Mfg. Co., Inc.
Cherokee, Okla.

● **We would refer you to a steel directory published by Steel Publications Inc., 108 Smithfield St., Pittsburgh; also the iron and steel works directory used by the American Iron & Steel Institute, Empire State Bldg., New York. A warehouse directory is published by the American Steel Warehouse Assn., Terminal Tower Bldg., Cleveland.—Ed.**

SHOT PEENING

Sir:

We enclose cheque value $18.50 and should be obliged if you would send us 36 copies of the booklet on "Shot Peening" which you quote at 50¢ each. Our cheque includes 50¢ for the pamphlet which you sent us as a specimen.

B. H. BLACKWELL, LTD.
48-51 Broad St.
Oxford, England

● **Reprints have been sent.—Ed.**

NITRIDING AIRCRAFT STEELS

Sir:

I am interested in the article "Nitriding of Aircraft Steels" by P. A. Haythorne which appeared in the Jan. 31 issue. It would be appreciated if you forward me tear sheets of this article.

L. P. WOOD
Materials Engineer
Experimental Engineering Div.
Bendix Aviation Corp.
Detroit 7

CASTING INSPECTION

Sir:

In the May 2 issue there was listed a program for the AFA Congress. On May 2 a paper entitled "Nondestructive Inspection of Castings" was to be presented, according to the program. Could you let me know how I might obtain a copy of this paper?

J. H. MORICE
Materials Engineer
Canadian General Electric Co.
Toronto

● **Your request should be directed to William W. Maloney, secretary, American Foundrymen's Assn., 222 W. Adams St., Chicago.—Ed.**

CONCENTRATION OR DIVERSION

Sir:

I would greatly appreciate 5 or 10 copies of Mr. Van Deventer's excellent editorial, "Concentration or Diversion," published in the Apr. 25 issue.

J. J. LAUDIG
Research Engineer
Delaware, Lackawanna & Western RR Co.
Scranton, Pa.

● **Tear sheets are being mailed with our compliments.—Ed.**

MACHINABILITY ASPECTS

Sir:

Please send me a reprint of the article "Metallurgical Aspects of Machinability" by F. J. Robbins.

J. M. BIRDSONG
National Tube Co.
Ellwood City, Pa.

● **We did not reprint this article. However, we are mailing tear sheets of the article which appeared in the Mar. 21 and 28 issues.—Ed.**

CEMENTED STEELS

Sir:

We would refer you to the issue of Apr. 25, the page called "Newsfront." In this you quote "A technique of infiltrating a molten copper alloy into a porous iron or steel compact made by standard powder metallurgy methods has been made commercially practicable . . ." We have carefully been through the reading matter and have been unable to find any further reference to this paragraph. Would you be good enough to let us know if there is any further information available.

J. G. CAMPBELL
C. C. Wade, Ltd.
Willesden, England

● **There is an article "Cemented Steels" in the May 2 issue that has a further reference to the "Newsfront" item. A copy is on its way to you.—Ed.**

WAREHOUSE STATISTICS

Sir:

I was referred to an article in THE IRON AGE, May 2 issue, quoting figures of the activities of distributors of steel during the war. I would appreciate very much if you will send me a few copies if you have any available.

CLAUDE R. GRABEEL
Steel Branch
Civilian Production Administration
Washington 25

● **We are forwarding several copies of the article "Regional Warehouse Statistics Made Available by CPA Comprehensive Report" and are glad to furnish them with our compliments.—Ed.**

OPA AMENDMENT

Sir:

Please send me three copies of the OPA Amendment to Steel Price Schedule No. 6, as printed on pp. 102 and 103 of the Mar. 7 issue.

D. E. MERRIMAN
Purchasing Agent
Stanley Works
New Britain, Conn.

STEEL SPECIFICATIONS

Sir:

Could you tell us if there is any single volume published which lists or summarizes all of the various steel specifications, i.e., Army, Navy, Aeronautical, AISI, ASM, ASTM, SAE, etc. If such a publication exists, we would appreciate your telling us where to obtain it.

H. CLIFFORD YOUNGEN
Forbes Steel Co.
Pittsburgh

● **In this connection we would refer you to the "National Directory of Commodity Specifications" prepared by Paul A. Cooley and Anne E. Rapuzzi, published by U. S. Dept. of Commerce, 1945. It covers standards and specifications of government agencies, etc.—Ed.**

GERMAN STAINLESS STEELS

Sir:

Would you please send us two copies of "German Stainless Steels" by Alexander L. Field appearing in the issue of Dec. 20, 1945.

D. P. McCULLOUGH
Monsanto Chemical Co.
Dayton 7

IRON POWDERS

Sir:

Please be kind enough to send two copies of "Carbursintering of Iron Powders" which appeared in the Feb. 28 issue. This article was by A. S. Margolies.

G. STEVENSON
Chief Design Engineer
F. J. Stokes Machine Co.
Philadelphia 20

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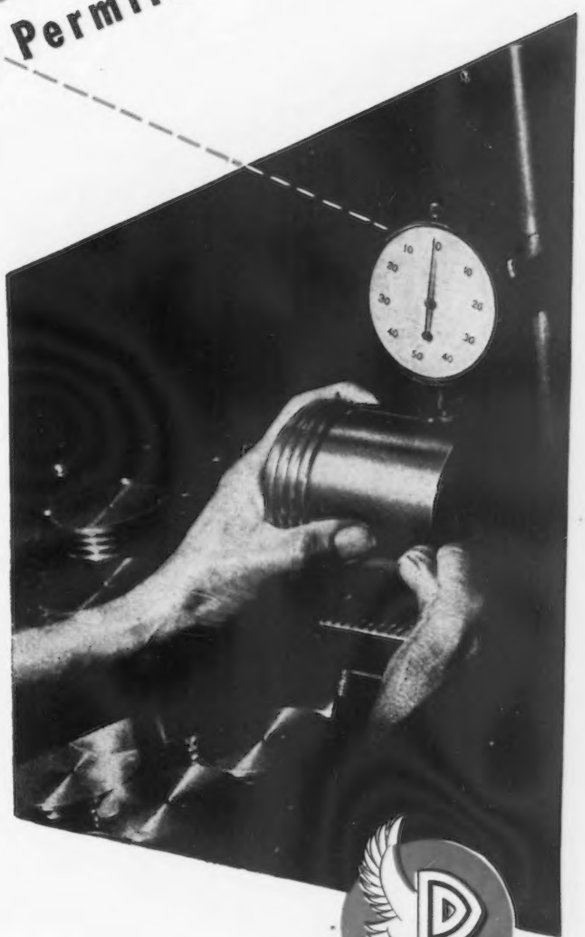

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ALUMINUM PERMANENT MOLD, SAND and DIE CASTINGS...HARDENED, GROUND and FORGED STEEL PARTS

This Industrial Week . .

- **Steel Ingot Rate Up 8.5 Points to 86 Pct**
- **Coal Miner Vacation May Not Affect Steel**
- **Steel Deliveries Expected to Improve Soon**

THE steel industry this week pushed its operating rate within three points of the pre-coal strike level, as ingot production hit 86 pct of rated capacity, up 8.5 points from last week's figure. Whether or not activity will gain three or four points next week is problematical in view of present coal supplies.

Coal output has gained rapidly in the past week and may soon reach record levels, but the 4-day shutdown in July may cause a temporary stringency in supplies for steel company use. Nevertheless and despite some opinion held to the contrary, the steel industry may get by the coal miners' vacation period without seriously interrupting output.

The miners generally will take off July 4, 5, 6 and 7, but two of these days are not considered as working days. By special agreement between John L. Lewis and the mine operators, the vacation period was reduced to four days in order to prevent a secondary crisis in fuel supplies. Because of time off during the strike, most miners are expected to report promptly for work on July 8.

While the steel operating rate continues to exhibit a strong upward trend it is not a criterion for the supply of steel in consumers' hands. For the first time since the steel strike, sheet and strip customers of some firms are in a position to expect shipments to the full extent of their quotas, although these may fall far short of what they would like to receive.

IN some cases these assurances from steel companies may come too late. The full effects of the complete shutdown in the steel industry earlier this year are now being felt. During the strike, manufacturers were forced to use up practically all inventory on hand. The result this week is that some midwestern plants have been forced to restrict manufacturing operations by as much as 50 pct until fresh steel shipments of a balanced nature are received.

In particularly bad shape are manufacturing concerns dependent upon steel warehouses for their requirements. Most warehouse inventories are virtually depleted and the full effect of special priority treatment granted the warehouses may not be reflected in increased receipts for several weeks.

During the second half of this year, the steel industry is expected to get into full stride of uninterrupted output with the result that customers will receive a steadier flow of material. It may be September, however, before the unbalance in steel products is eliminated, thus allowing manufacturing concerns to reach the highest point of efficiency in their production cycles.

With the steel industry going into a period of sustained operations, some observers are fearful that the unusually large backlogs will be whittled down rapidly because of duplicate ordering. Many customers have placed identical orders with more than one firm in the hope that earlier delivery could be obtained and the excess orders promptly canceled. Steel companies have no way of knowing the magnitude of duplications in steel ordering because they have no access to competitors' books. However, the total of such duplication is probably heavy.

IN today's sellers' market, however, customers fortunate enough to obtain delivery on orders which they had duplicated with other firms, will be hardly likely to cancel any such orders. As production continues, however, backlogs in the steel industry are bound to be cut down to conform more realistically with current conditions. On the other hand with the possibility that steel price control will be out in 1947, the old-time steel consumer, fearful of rising prices, would keep all orders on steel mill books as a hedge.

Until such time as steel consumers meet their own customers' demands there will be little cause for worry as to the future status of the steel operating rate. However, when inventories begin to pile up in consumers' hands and demand for finished steel items drops, a pattern similar to those preceding a drop in steel activity in the past will be formed.

THE government seizure of the connecting railroad subsidiary of Jones & Laughlin Steel Corp. last week may be indicative of what may be done by the administration in the future. This railroad was taken over after trainmen had struck and shut down the company's Pittsburgh works. Demands were for the same treatment as was accorded main line railroad workers. Connecting railroad subsidiaries of other steel firms are expected to strike and if so the government will be forced to take them over.

The scrap situation this week remains tighter than ever and is rapidly reaching the point where some extra effort will have to be made to increase the supply. While some scrap sources may have held back supplies hoping for an increase in ceiling prices, such tonnage was a small percent of the total. The shortage of scrap is due more to demand and lack of scrap reserves than to the price angle.

Priority assistance to farm implement manufacturers is expected to be of little moment until strikes at two major farm implement plants are settled. Furthermore practically all steel firms have always cherished a fondness for a sales relationship with farm implement makers, not only because of the heavy tonnages involved but because of the variety of products needed by that industry. Consequently the institution of priority assistance will mean in many instances a continuation of what has been the common practice.

• **STEEL PRODUCTION**—Production of steel ingots and steel for castings during May of this year was approximately 1,787,000 net tons below the total for April because of the coal miners' strike, and 3,376,000 tons below May a year ago, according to the American Iron & Steel Institute. The industry operated at an average of 52.2 pct of capacity during May and produced 4,073,465 net tons. This compares with an average rate during April of 77.5 pct and production of 5,860,258 net tons. In May 1945, production of steel ingots and steel for castings amounted to 7,449,667 net tons at an average rate of 91.8 pct. During the 10-month period from August last year, when the war ended, through May of this year, the industry produced 51,276,314 net tons of steel ingots and steel for castings. This compares with the production of 73,312,253 net tons from August 1944 to May 1945.

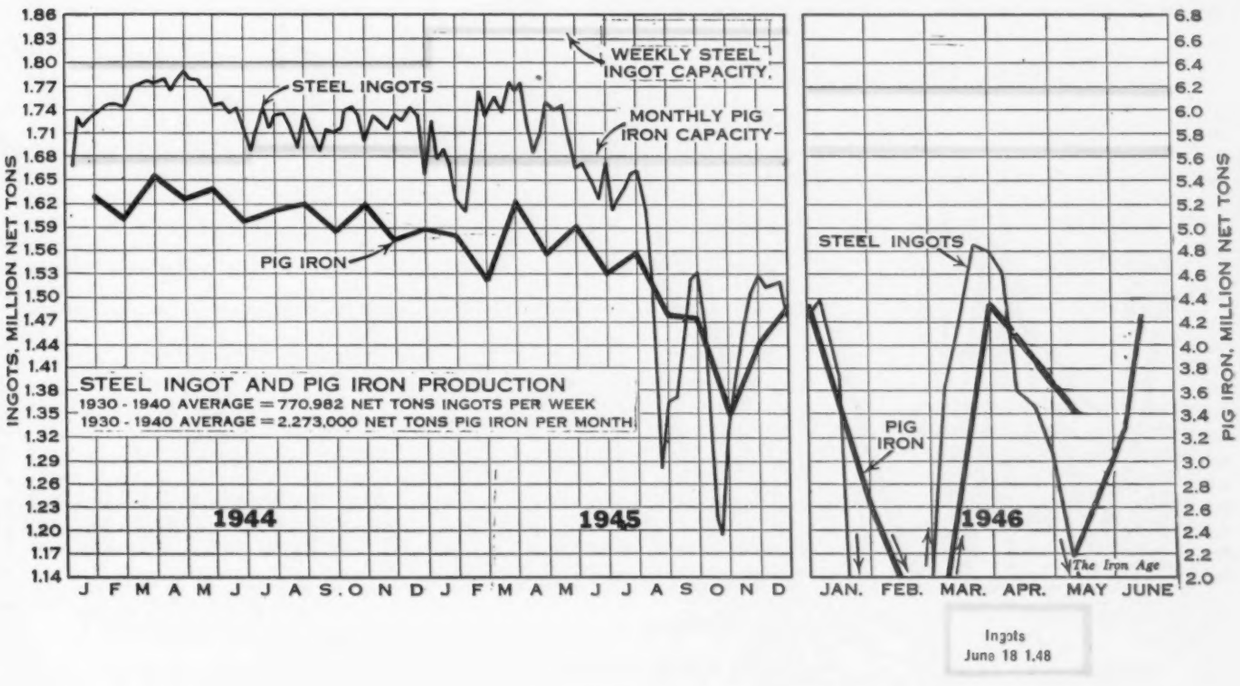
• **LEASE EXTENDED**—The lease of the Republic Steel Corp. on the South Chicago steel plant has been extended indefinitely on a month-to-month basis, WAA announced on June 12. The new lease will remain in effect until final disposition of the plant is made. During this period, Republic will pay a monthly rental estimated at $55,000 and will continue to operate the blooming mill and manufacture coke.

• **CAR BUSINESS ROLLS ALONG**—Railroad car and locomotive builders are expecting an inquiry soon from the Erie Railroad for 23 diesel locomotives, 1000 freight cars and 300 hopper cars. Now up for bids are 1500 steel box cars for the Union Pacific. A new surge of foreign business may be indicated by current negotiations of the Russian Purchasing Commission for 225 air dump cars. R. W. Hunt Co. is reported interested in 50 to 100 box cars.

• **FRENCH COAL PRODUCTION**—During the week ended May 25 coal production throughout France reached the record figure of 1,009,173 tons, as against 982,555 tons during the preceding week. Coal production in the northern French coalfields and in the Pas-de-Calais region alone reached new record outputs during the past few weeks, according to a French Ministry of Industrial Production statement, with the unsurpassed total of 101,620 tons for the single day of May 29.

• **U. S.-FRENCH AGREEMENT**—J. J. Carnaud and Forges de Basse-Indre decided at a meeting on May 6 to increase its capital from $306,600 (36,485,000 francs) to $342,600 (40,790,000 francs) by issuing 8608 shares, 8108 of these being allocated to the Continental Can Co. of New York in compensation for commercial and technical agreements.

• **STEEL EARNINGS DOWN**—Average hours per week and average hourly earnings for wage earners in the iron and steel industry dropped slightly during April, as a result of temporary layoffs necessitated at some plants during the first month of the coal miners' strike, and because of the trend toward the elimination of overtime, according to the American Iron & Steel Institute. In April, wage earners worked an average of 37.2 hr per week, compared with 37.9 in March. Average hourly earnings of wage earners during April was 134.1¢ per hr. In March, the average wage was 135.1¢ per hr. Average number of employees, during April was 581,800, compared with 570,500 during March. The fact that temporary layoffs were necessary at some plants had no effect upon the April employment figure, for the laid-off workers were still kept on the payrolls. The industry's total payroll for April was $134,347,800. In March, a longer month than April, the total payroll was $138,756,100.


INGOTS, MILLION NET TONS
PIG IRON, MILLION NET TONS
WEEKLY STEEL INGOT CAPACITY
STEEL INGOTS
MONTHLY PIG IRON CAPACITY
PIG IRON
STEEL INGOT AND PIG IRON PRODUCTION
1930 - 1940 AVERAGE = 770,982 NET TONS INGOTS PER WEEK
1930 - 1940 AVERAGE = 2,273,000 NET TONS PIG IRON PER MONTH
1944
1945
1946
J F M A M J J A S O N D J F M A M J J A S O N D
JAN. FEB. MAR. APR. MAY JUNE
The Iron Age
Ingots
June 18 1.48

Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
June 11.....	75.0	80.0	67.0	75.0	85.0	101.0*	75.0	89.0	98.0	57.0	70.0	60.0	98.0	77.5
June 18.....	90.0	86.0	81.0	85.0	87.5	102.0	92.0	95.0	101.5	57.0	104.0	60.0	87.0	86.0

* Revised

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W&D 9641-C

Justice Dept. Approves Sale of Geneva Plant to U. S. Steel

Salt Lake City

• • • **The Geneva Steel** Plant will probably go down in steel history as the most written about, the most talked about and the most controversial project, but finally after an "on again, off again, on again" series of moves, the western interests have a new source of steel supply and the U. S. Steel Corp. can now proceed with plans for maintaining its sales position in the West.

The acquisition of Geneva by the corporation also represents the fulfillment of a long desire on the part of Walther Mathesius, Geneva president, and former vice-president in charge of operations for U. S. Steel Corp. of Delaware. It was he who continually insisted that the location of the Geneva plant was not only good, but that if the plant could be capitalized on a comparable basis with other steel firms, a definite profit could be made.

Whether or not Mr. Mathesius will continue as president of Geneva after U. S. Steel proceeds with its revamping program there, remains to be seen, but the odds are favorable that the corporation will keep him there and say, "Prove it." It was not so long ago that the steel corporation's directors and top officials were so fed up with the outside factors of the Geneva problem that they decided to go no further and to drop the whole thing.

At the insistence of some governmental officials, the U. S. Steel was induced to rebid on the Geneva plant and Benjamin F. Fairless, president, took this chance to make what he and his associates thought would be not only a realistic bid but a final one. The secrecy surrounding the contents of the corporation's bid on Geneva was held so tightly that no one knew the contents but those involved, until the bid was presented at practically the eleventh hour.

The corporation's trials and tribulations on the Geneva question, starting from the day the government asked the company to build Geneva up to June 17 when the Justice Dept. approved the sale of the plant to U. S. Steel, presented one of the toughest public relations and "Freedom from political entanglement" problems ever faced by a large corporation. The steel corporation has always been under the white hot glare of public scrutiny because of its size and the ramifications of its business. That it was able to get through the Geneva period and come out on top is a credit to those involved with the job of walking the public tightrope.

For other news of Geneva and West Coast steel problems see THE IRON AGE, *Sept. 7, 1944 p. 60; Dec. 21, 1944 p. 72; Feb. 15, 1945 p. 101; May 17, 1945 p. 99; June 21, 1945 p. 95; May 9, 1946 p. 116.*

Although some western interests might have wanted to see a western firm obtain Geneva, off-the-record talks with far western manufacturers indicated a solid support for U. S. Steel. Added to this was the support of the state of Utah, its congressmen and Dr. J. R. Mahoney, director of Utah University's Bureau of Economics and Business Research.

With many steel firms having withdrawn from western markets on much desired steel sheets and strip, the sale of Geneva will probably soon result in a rehabilitation of equipment there leading towards a new source of steel sheet supply. Furthermore Mr. Fairless has stated that Geneva would become a basing point if his firm obtained the plant. It is hardly probable that such a basing point would be anything but equal to or only slightly higher than major basing points at other centers.

At the present time steel capacity of the Geneva plant is 1,283,400 tons. Blooming mill capacity is 1,058,800 tons, and the present structural mill is rated at 250,000 tons. The plate mill which is semi-continuous and which had a capacity of 700,000 tons yearly will be revamped so as hot-rolled sheets and coils will be produced to the extent of 385,000 tons a year. Geneva officials are past masters at making quick and radical changes with existing equipment, and the fact that the plant was laid out with an eye towards changes and expansion will probably result in a reconversion job finished much sooner than generally supposed.

Tom Clark Approves

Washington

• • • **"I do not view the sale of the steel plant at Geneva, Utah, by the War Assets Administration to the U. S. Steel Corp. as a violation of the anti-trust laws," Attorney General Tom C. Clark said in a letter on June 17 to Lt. Gen. E. B. Gregory, War Assets Administrator. Thus ended the long series of discussions over who would get the Utah steel plant. That is, unless there are future complications.**

Mr. Clark said, however, that his department will continue to study and evaluate the activities of the steel industry with a view to preventing, eliminating or redressing any abuses contravening the anti-trust laws.

This statement by Tom Clark, apparently indicated that the Justice Dept., while approving the sale of Geneva to U. S. Steel, would continue its scrutiny of the steel industry's pricing system. Submission of statistics by Mr. Clark led to the view that the department did not consider the U. S. Steel as a monopoly.

On this point the Attorney General said in part, "The memorandum indicates that during 1945 U. S. Steel Corp. made 27.6 pct of the sales in dollar volume of the industry. If the capacity of the Geneva plant, amounting to 1,283,000 tons, is added to the present capacity of U. S. Steel, that corporation's share of the national capacity will rise from its present 31.4 pct to 32.7 pct of the national total.

"This is to be contrasted with the position of the U. S. Steel Corp. at the time of its formation in 1901 when it produced 50.1 pct of the nation's iron and steel output," Mr. Clark said. He also analyzed U. S. Steel's percent of the capacity in the Far West which he said was 17.3 pct of the total. If the Geneva plant is added to the corporation's far western capacity, U. S. Steel would have 39 pct of the total far western capacity. The Attorney General pointed out, however, that far western steel capacity amounts only to approximately 5.3 pct of the total capacity of the steel industry in the United States.

Pig Iron Allocations Plan for Castings Producers Given to Advisory Committee

Washington

• • • **A plan for** allocating pig iron to producers of castings for certain farm machinery and housing items and railroad brake shoes, similar to the distribution system for steel products announced last week, was laid before the CPA Pig Iron Industry Advisory Committee on June 14.

CPA also told the group that premium payments for pig iron would be authorized if necessary to get the required production of housing material. Such payment is permitted under the recently enacted emergency housing legislation. In addition, the government hopes to blow in three additional furnaces.

Finally, CPA has taken under advisement a plan for compensating producers for extra freight charges if such charges became necessary due to CPA directives requiring foundries to buy from specific merchant furnaces.

Under the allocation plan, producers of the critical products, to be announced by CPA at a later date, would inform CPA of their requirements. CPA would then, acting under directives to order M-21, authorize the purchase of specific tonnages of pig and designate the furnaces with which the orders are to be placed.

While plans for blowing in the three furnaces at Gadsen, Ala., Granite City, Ill., and Struthers, Ohio, were announced more than four months ago the furnaces are not yet in operation, according to CPA. A high CPA official said that the primary reason for the delay can be laid at the doors of OPA. It is believed that a price increase of sufficient magnitude would enable these furnaces to be operated without subsidy support, as had been originally contemplated. However, CPA says that it has not abandoned its subsidy plan and it may still be put into effect.

OPA action on the pig iron price increase was held up due to the delay in setting new ceilings on coal which are expected this week.

The three furnaces slated to be reopened are: A government-owned furnace at Gadsen, Ala., operated by Republic Steel Corp., monthly capacity, 6000 tons; another government-owned unit at Granite City, Ill., operated by the Koppers Coal & Coke Co., monthly capacity, 18,000 tons; and the Struthers Iron & Steel Co. furnace at Struthers, Ohio, monthly capacity, 13,000 tons.

It is estimated that capacity output from the Gadsen furnace would completely ease the shortage of cast iron housing materials in the southern states.

The coal shortage is another delaying factor. CPA is reluctant to open new facilities if it is not found possible to supply them with all needed raw materials. The reopening of 15 ordnance plants for the production of fertilizer will add another 100,000 tons of coal a month to the requirements for critical products, thereby increasing the CPA headache by that amount.

International Nickel Signs Agreement With Two Canadian Locals

Toronto

• • • **International Nickel** Co. and two locals of the International Union of Mines, Mills and Smelter Workers, have signed an agreement whereby International Nickel grants a basic increase of 10¢ an hr in wages, and application, in general, of the Rand formula for union security. The new agreement affects between 6500 and 7000 workers in Sudbury and 1325 in Port Colborne, R. H. Carlin, M.P.P., board member and director of the union in district 8, announced. "The agreement," Mr. Carlin said, "gives us the equivalent of the Rand formula for union security." He explained the Rand formula as providing that every employee, whether a union member or not, must pay dues to the local union. It was this formula, created by Mr. Justice Ivan C. Rand of the Supreme Court of Canada which settled the Ford strike in Windsor earlier this year. By the new agreement, all employees except supervisory workers and office workers in the Sudbury and Port Colborne plants of International Nickel will pay dues to the respective union locals.

Besides higher pay and union security clauses, the new contract provides for 2 weeks' vacation with pay for all employees having 5 yr or more of service and one week with pay for all with one or more years up to five. The new wage rate will give miners, who comprise the majority of members of the union, 91¢ an hr for a 48 hr week. Above this is an "afternoon differential" of 3¢ an hr, making in all 13¢ an hr increase for those going on shifts after noon. "Generally these shifts begin at 3 or 4 p.m.," Mr. Carlin explained.

Iron Window Prices Hiked

Washington

• • • **Effective June 14**, an increase of 13 pct over Oct. 1, 1941 prices has been authorized for steel and iron windows. The OPA announcement said that resellers are permitted to pass-through the percentage increase.

OPA's reconversion pricing formula was used to compute the increase. This indicated a 44.6 pct increase in basic wage rates and 14.6 pct rise in material cost since October 1941.

Silvery Pig Prices Advance

Chicago

• • • **Electric furnace** silvery pig iron prices have been increased by $2.50 per gross ton, a prominent producer here has announced. The increase, the first since June 24, 1941, was effective June 15 on spot orders and will be effective July 1 on contracts. The advance is permitted by OPA's action of June 12 by which ferrosilicon prices were removed from control.

OPA Decontrols Dolomite

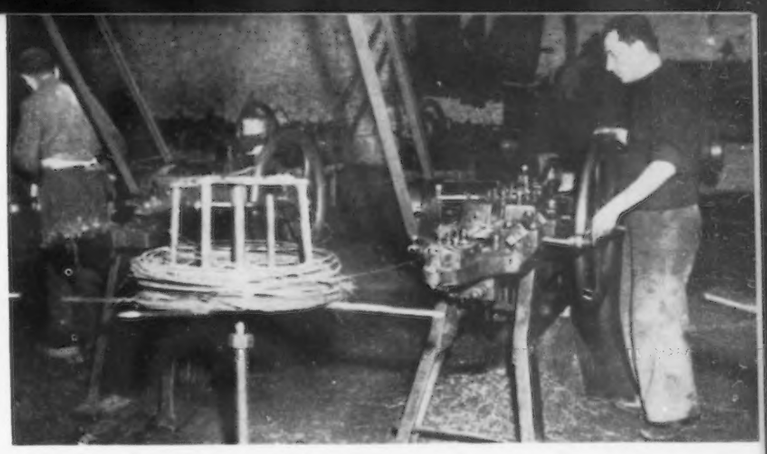
Washington

• • • **OPA on June 18** announced suspension of price control of dead burned dolomite and dead burned magnesite for openhearth furnace use and raw dolomite and fluxing limestone for blast furnace and other metallurgical uses. Decontrol became effective on June 19.

NEWS OF

Last Increase in Nail Prices Not Expected To Speed Delivery

By T. E. LLOYD



WORLDWIDE SHORTAGE: *Nails are not only in short supply in the U. S. but in other countries as well. Here is a scene in a factory in Europe where nails are being made from torpedo wire.*

o o o

Pittsburgh

• • • **Common garden variety** nails for building houses and nailing boxes shut are one of the shortest items from a supply standpoint that the steel industry produces. Nail manufacturers lay the blame for the shortage to OPA price ceilings, pointing out that they are too low and very unrealistic. Meanwhile, black market operators chuckle with glee at the shortage and collect fantastic prices at the expense of the housing program. Where crates for export of food are concerned, at the expense of the livelihood of many in famine smitten Europe, the situation is equally bad.

Where are all the nails? In the first place, production this year has been spotty. A quota of 795,000 tons has been set, but strikes affecting steel output have hampered nail output. In the second place, steel companies prefer to place their steel into products that bring a better profit. The $10 a ton price increase granted by OPA recently, which amounts to 50¢ a 100 lb keg, was only two-thirds of the amount requested by the industry. Consequently, observers feel that the price increase will not lead to very much of an increase in nail output. The increase was a signal for individual companies to hit up OPA for price relief on an individual scale. Just what will come of this is not known, but some have asked for as much as $10 a ton additional plus increases on extra charges.

Production of nails in 1944 totaled 642,497 tons, or 51.4 pct of rated capacity, according to the American Iron & Steel Institute. However, it is believed that 1944 production was considerably better than 51.4 pct of capacity, because there are several known instances where capacity figures of certain producers are highly inflated. For example, one company's capacity is only about 62 pct of that shown by the institute, while another's is only 52 pct of the institute's figure. Another company has announced its intention of getting completely out of the nail business, and it is believed that while pressure was brought to bear on the company to continue nail production, present production is not near rated capacity.

Other companies, whose actual capacities have not been checked, are known to be producing far less than could be produced because of the price situation, and the non-integrated manufacturers have great difficulty in getting rods at the present prices. The rod price situation is reported to be as bad as the price picture on nails.

The American Iron & Steel Institute lists nail and staple manufacturing capacity at 1,266,870 tons. This is based on maximum operation of all nail machines in the industry on the optimum size nails. In actual practice this doesn't occur. In the first place, available steel supplies have considerable bearing on nail production, especially since it is a marginal profit item. Further, nail machines cannot always be operated on optimum products, and strikes, slowdowns, and other factors affecting steel production always hamper nail output.

Considerable attention is being paid by producers to the current black market situation existing in nails. In fact, quite a black market price schedule can be obtained without too much difficulty. It reads something like this: $16 a keg, Pittsburgh; $15 to $20 a keg, Middle West; $25 to $30 a keg, West Coast; $20 to $25 a keg, East Coast. No one seems to know where the nails come from or to whom they are sold, but the gossip has it that plenty are moving in these channels.

Further, pressure is being brought to bear on the services for the release of reported large quantities of nails held in stock. Estimates approaching 125,000 tons of nails are being held by the services, a quantity that would go a long way toward solving the nail shortage—if such stocks actually exist. However, with the quota set for 795,000 tons in 1946 and 845,000 tons in 1947, there may be a lot of excuses why these quotas are not achieved but the main one still will be price.

May Surplus Sales Up

Detroit

• • • **Sales of** capital and producers goods by the Detroit Regional Office of the War Assets Administration were larger during May than for any month since operations were started, according to H. F. Eckfeld, regional director. The cost of goods sold was $14,793,295 and the sale price $6,650,730, a recovery of 44.9 pct. Consumers goods are not included in these totals.

The present inventory of capital and producers goods in the warehouses of the Detroit region of WAA is $258 million. With new property being added at the rate of $20 million a month and disposals equaling $15 million, the net addition to inventory during the month was approximately $5 million.

The "sales at site" program recently adopted by WAA which permits buyers to go direct to warehouses and purchase "over the counter," is expected to accelerate the disposal of surplus stores in this area, according to Mr. Eckfeld.

AMERICAN IRON AND STEEL INSTITUTE

Production of Open Hearth, Bessemer and Electric Steel Ingots and Steel for Castings

YEAR 1946

Based on Reports by Companies which in 1945 made 97.6% of the Open Hearth, 100% of the Bessemer and 85.8% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity	Net tons	Percent of capacity		
January	3,528,090	51.1	207,512	47.4	136,452	29.2	3,872,054	49.6	874,053	4.43
February	1,300,944	20.9	25,905	6.6	65,668	15.6	1,392,517	19.8	348,129	4.00
March	5,946,698	86.2	363,949	83.1	196,400	42.0	6,507,047	83.3	1,468,859	4.43
1st Quarter	*10,775,732*	*53.8*	*597,366*	*47.0*	*398,520*	*29.4*	*11,771,618*	*51.9*	*915,367*	*12.86*
* April	5,333,139	79.8	286,088	67.5	241,031	53.3	5,860,258	77.5	1,366,028	4.29
† May	3,708,790	53.7	153,718	35.1	210,957	45.1	4,073,465	52.2	919,518	4.43
June										4.29
2nd Quarter										*13.01*
1st 6 months										*25.87*
July										4.42
August										4.43
September										4.28
3rd Quarter										*13.13*
9 months										*39.00*
October										4.43
November										4.29
December										4.42
4th Quarter										*13.14*
2nd 6 months										*26.27*
Total										52.14

Note—The percentages of capacity operated are calculated on weekly capacities of 1,558,041 net tons open hearth, 98,849 net tons Bessemer and 105,491 net tons electric ingots and steel for castings, total 1,762,381 net tons; based on annual capacities as of January 1, 1946 as follows: Open hearth 81,236,250 net tons, Bessemer 5,154,000 net tons, Electric 5,500,290 net tons, total 91,890,540 net tons.

* Revised.
† Preliminary figures, subject to revision.

YEAR 1945

Based on Reports by Companies which in 1945 made 97.6% of the Open Hearth, 100% of the Bessemer and 85.8% of the Electric Ingot and Steel for Castings Production

Period	Estimated Production—All Companies								*Calculated weekly production, all companies (Net tons)	Number of weeks in month
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	*Net tons	*Percent of capacity	Net tons	Percent of capacity	*Net tons	*Percent of capacity	*Net tons	*Percent of capacity		
January	6,469,340	90.5	379,062	76.0	355,910	76.8	7,204,312	88.8	1,626,256	4.43
February	5,968,326	92.4	347,227	77.1	337,212	80.6	6,652,765	90.8	1,663,191	4.00
March	6,927,939	96.9	398,351	79.8	379,639	81.9	7,705,929	95.0	1,739,487	4.43
1st Quarter	*19,365,605*	*93.3*	*1,124,640*	*77.6*	*1,072,761*	*79.7*	*21,563,006*	*91.5*	*1,676,750*	*12.86*
April	6,541,627	94.5	372,952	77.2	375,308	83.6	7,289,887	92.8	1,699,274	4.29
May	6,664,117	93.2	402,100	80.6	383,450	82.7	7,449,667	91.8	1,681,640	4.43
June	6,129,763	88.5	379,807	78.6	330,952	73.7	6,840,522	87.1	1,594,527	4.29
2nd Quarter	*19,335,507*	*92.1*	*1,154,859*	*78.8*	*1,089,710*	*80.0*	*21,580,076*	*90.6*	*1,658,730*	*13.01*
1st 6 Months	*38,701,112*	*92.7*	*2,279,499*	*78.2*	*2,162,471*	*79.9*	*43,143,082*	*91.0*	*1,667,688*	*25.87*
July	6,318,975	88.6	381,832	76.7	284,764	61.6	6,985,571	86.3	1,580,446	4.42
August	5,172,344	72.3	347,088	69.5	215,885	46.6	5,735,317	70.7	1,294,654	4.43
September	5,435,799	78.7	352,847	73.2	193,829	43.3	5,982,475	76.3	1,397,775	4.28
3rd Quarter	*16,927,118*	*79.9*	*1,081,767*	*73.1*	*694,478*	*50.5*	*18,703,363*	*77.8*	*1,424,475*	*13.13*
9 months	*55,628,230*	*88.4*	*3,361,266*	*76.5*	*2,856,949*	*70.0*	*61,846,445*	*86.6*	*1,585,806*	*39.00*
October	5,146,787	72.0	242,122	48.5	207,867	44.8	5,596,776	69.0	1,263,381	4.43
November	5,641,308	81.5	358,664	74.2	200,494	44.7	6,200,466	78.9	1,445,330	4.29
December	5,523,277	77.4	343,266	68.9	191,394	41.4	6,057,937	74.8	1,370,574	4.42
4th Quarter	*16,311,372*	*76.9*	*944,052*	*63.8*	*599,755*	*43.6*	*17,855,179*	*74.2*	*1,358,842*	*13.14*
2nd 6 months	*33,238,490*	*78.4*	*2,025,819*	*68.5*	*1,294,233*	*47.1*	*36,558,542*	*76.0*	*1,391,646*	*26.27*
Total	71,939,602	85.5	4,305,318	73.3	3,456,704	63.4	79,701,624	83.5	1,528,608	52.14

Note—The percentages of capacity operated are calculated on weekly capacities of 1,614,338 net tons open hearth, 112,658 net tons Bessemer and 104,640 net tons electric ingots and steel for castings, total 1,831,636 net tons; based on annual capacities as of January 1, 1945 as follows: Open hearth 84,171,590 net tons, Bessemer 5,874,000 net tons, Electric 5,455,890 net tons, total 95,501,480 net tons.

*Revised January through December, 1945.

Strikes Cause CPA to Cut Third Quarter Export of Tinplate

Washington

By GENE HARDY

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• • • **The third quarter** allotment of tinplate for export, badly slashed as a result of the steel and coal strikes, has been finally set at 112,000 short tons. Originally, the foreign countries presented requirements of 302,399 tons to the Office of International Trade of the Dept. of Commerce. OIT came up with minimum screened requirements of 167,075 tons. The recommendation of CPA's Export Div. amounting to 112,000 tons, the minimum quantity necessary to insure the prevention of serious losses of perishable food in foreign areas, was approved on June 10.

With the exception of the American Republics, Continental France and Turkey, the stated requirements were based upon carefully developed estimates of needs for food pack only, and were supported by documentary data as to stocks, food processing schedules, and anticipated supplies from sources other than the United States. The Latin American requirement was based on license applications received by the Office of International Trade. The Turkish and French figures were not supported.

The importing countries also had to take a cut in the first half allotments, as a result of the strikes. The original first half allotment totaled 246,143 short tons, but after the strike this was reduced to 154,839 short tons. All countries except Turkey, the Philippines, French North Africa, China, and the Middle East (Syria, Iran, Palestine, Lebanon and Egypt) received smaller quantities as a result of the strike. The UNRRA allotment was increased slightly. All nations receiving first half allotments, except Russia, were given third quarter quotas.

Cuts were necessary because of the seasonal demand in the United States and if it were not for the short food situation throughout the world CPA would not grant priorities assistance for any amount of steel products for export purposes.

The cut effected by CPA was strongly opposed by the OIT, formerly a branch of FEA, on the grounds that the severe reduction in the first half quota necessitated by work stoppages, together with the very small export shipments in the fourth quarter of 1945, has resulted in widespread depletion of stocks and has led to a situation where vitally needed perishable food will be lost throughout the world unless shipments are programmed from this country appreciably in excess of 112,000 tons.

Actually, CPA stretched a point in allocating 112,000 tons and takes the position that through careful planning, holding stocks to the absolute minimum, and obtaining full assistance from the United Kingdom, it will be possible for most countries to get by in their food processing with the third quarter allotment from this country.

The largest amount was allotted to Australia since that country's food industry reaches a peak in the two winter quarters and stocks are practically nonexistent. To meet the deficit the United States has recommended an increase in the British allotment of 5040 short tons to 10,000 short tons, a maximum of three months' stocks, and a 15 pct reduction on fourth quarter usage. The United States also urged an increase in the British quota to South Africa.

The Continental French requirement of 10,000 short tons was developed by the French Trade Commission in this country. No data as to usage, supplies from domestic production, or stocks were given to support it. In addition, a check as to probable need indicated that no shipments over and above those scheduled under the first half allotment should be necessary to take care of the French food pack. Consequently, no quota was given to France for the third quarter.

Belgium presented requirements for the second, third and fourth quarter of 21,150 short tons, but this amount exceeds by 3500 tons the requirement presented last November for the entire year of 1946. Therefore, the Belgian allotment was held to a maximum of 2000 short tons. The amount alloted to Norway was estimated to be sufficient for the fish pack alone.

If allowed, the Netherlands request for 12,500 short tons in the third quarter would mean receipt of 34,320 short tons by that country from the United States under first, second and third quarter allotments. This compares with an original requirement presented by the Dutch of 33,000 short tons for the entire year of 1946. In view

	Pre-Strike First Half Allotment	Post Strike Adjusted First Half 1946 Allotment	Third Quarter Stated Requirements	OIT Screened Requirements	Recommended Quota
Australia	59,294	25,294	55,415	30,000	25,000
New Zealand	12,078	6,078	8,512	4,250	4,000
South Africa	10,000	5,000	10,000	10,000	6,850
Middle East [1]	979	1,163	2,034	750	650
Turkey	210	391	15,000	1,000	1,000
Philippines	0	750	3,800	3,025	1,500
North Africa	5,242	5,242	2,923	1,725	1,500
France	13,188	11,188	10,000	10,000	0
China	300	1,196	9,465	5,900	1,500
Belgium	16,661	13,181	6,758	4,000	2,000
Denmark	2,500	2,000	2,500	2,500	2,000
Norway	4,000	3,500	6,000	6,000	5,000
Netherlands	27,820	21,820	12,500	12,500	3,000
Italy	8,000	7,000	3,000	3,000	2,500
UNRRA	6,856	6,606	1,250	1,250	1,250
Portugal and Spain	2,000	1,650	2,150	2,150	2,150
Sweden	6,303	4,803	6,000	6,000	3,500
Switzerland	2,472	1,472	1,000	1,000	500
Finland	0	0	100	100	100
Russia	11,411	2,317	.....	.....	.....
American Republics	52,359	27,819	131,000	56,125	45,000
All Other and Contingencies	4,450	6,169	5,800	5,800	3,000
Total	246,143	154,839	302,399	167,075	112,000

[1] Middle East includes Syria, Iran, Palestine, Lebanon and Egypt.

of the fact that the bulk of 21,850 short tons scheduled by this country during the first and second quarters will reach the Netherlands only in the third quarter, after an important part of this year's crop season has passed, it was decided that substantial shipments out of third quarter rollings were not justified.

The allotment for Portugal and Spain consists of tinplate required to meet the needs for packaging fish to be shipped to the United States. This allotment takes no account of the needs of the Portuguese fish industry (estimated at 8000 short tons) to process fish being allocated by the Combined Food Board to European areas other than the United Kingdom.

The Dept. of State and the Dept. of Commerce have repeatedly protested the first half allotment of only 27,819 short tons of tinplate to the American Republics. Commerce consequently urged that a minimum of 56,000 short tons be provided during the third quarter. CPA felt that since tinplate shipped during the third quarter cannot be used to take care of needs which were not met in the first and second quarters an allotment of 56,000 tons was out of line. Latin American receipts have generally averaged under 40,000 short tons. Argentina and Brazil received the lion's share of the Latin American allotment.

Also included were small quantities of electrolytic tinplate for distribution of petroleum products in 5-gal cans where secondary native use of food is involved. Countries receiving this allotment were the Philippines, China, Greece, East Africa, India, and Indo-China.

Housing Products To Be Self-Certified By Producers of Steel

Washington

• • • **Under the** CPA limited steel allocation system (THE IRON AGE, June 13, p. 76), housing products and certain classes of farm machinery and equipment may be self-certified by manufacturers for needed steel. In cases of extreme emergency CPA may authorize the placing of certified orders to fill severely limited requirements for the Army, Navy, Coast Guard, Maritime Commission, Veterans Administration, Federal Public Housing Administration and Canada for export. No applications can be made by manufacturers for this authority unless they are specifically requested to do so by the appropriate government agency.

Housing products which may be self-certified by manufacturers follow: Pressed steel bathtubs, sinks and lavatories; warm-air furnaces and floor furnaces; convector radiation; furnace pipe, fittings and duct work; steel registers and grills.

The following classes of farm machinery and equipment may also be certified: Combines (harvester-threshers); grain binders; corn binders, excluding sled and wheel type; corn pickers; field ensilage harvester—row type; potato diggers and pickers, excluding walking plow type; bean cutters or pullers; sugar beet and cane harvesting equipment; peanut diggers; farm haying machinery, excluding field bale loader; ensilage cutters (silo fillers); corn shellers; potato sorters and graders; fruit and vegetable graders, washers, sackers and conveyors; farm tractors, wheel type.

In addition, steel products may also be certified for the manufacture of railroad brake shoes. Reinforcing rod and mesh may be certified for dwelling units only.

The new emergency distribution system for steel was set up under Direction 12 of the Steel Conservation Order M-21. A manufacturer of one of the critical products who on June 17 did not have any purchase orders placed with a steel mill, whether certified or otherwise, may place a certified order on a warehouse without CPA authorization. However, a manufacturer may not, without specific authorization of CPA, certify orders for steel to be used in a plant that is not in production because of work stoppages. Also no certification can be made on a warehouse by a manufacturer whose plant is out of production because of work stoppages. When manufacturers need more material to produce the listed critical products and are not authorized by the direction to certify enough orders on mills to insure this production, they may apply to CPA for additional authorization.

Limitations on the amount of steel which may be certified in any one month are confined to 40 pct of the amount to be put into production in the third quarter. None of the certified steel may be used to build up inventories.

To protect steel producers and distributors against an undue pile-up of orders, the direction contains certain safeguards—(1) a steel producer need not accept a certification on a previously accepted purchase order or a new purchase order which it receives after the first day of the month previous to the one in which delivery is requested. That, is, requests for August delivery must be received by the mill by July 1. However, in the case of July deliveries, certification must be received by the mill by June 17, 1946.

(2) A warehouse need not accept any certified order for a single product classification of steel in excess of 10,000 lb if delivery would deplete the warehouse stock to a point where distribution of steel by that particular warehouse would be seriously impaired. Schedule 1 of Order M-21 lists the product classifications of steel.

CPA also announced that Direction 13 to Pr. Reg. 1, which suspended preference ratings (except AAA ratings on distributors) on steel, remains in effect for the time being.

Direction 9 to Order M-21, which provides certifications for tin mill products for food and pharmaceutical purposes, also remains in effect. That direction explains how producers of tin mill products should schedule any certified orders. However, the Direction has been amended so that the 15 pct of tin mill production which can be distributed at the producer's discretion is subject to the certification plan in Direction 12.

The agency also said that steel producers and warehouses must furnish any reports required by CPA from time to time, subject to approval by the Budget Bureau.

Weekly Gallup Polls . . .

Public Criticizes Handling of German Occupation

Princeton, N. J.

• • • **The occupation of** Japan has been carried out far more successfully than the occupation of Germany, in the opinion of American voters polled from coast to coast by the institute, according to George Gallup, director, American Institute of Public Opinion.

Six out of every ten think that the United States has done a good job in Japan, whereas only about three in ten say the same about handling of the American occupation zone of Germany.

The two occupations present, of course, somewhat different problems, since American forces control the whole of Japan but only a part of Germany. Also the great personal popularity of General Douglas MacArthur with the American public is undoubtedly a factor which enters into the more favorable reaction toward the Japanese occupation.

The country's attitude was measured in the following two questions:

"Do you think we have done a good job or a poor job in handling our occupation of Japan?"

The vote:

	Pct
Good	60
Fair	15
Poor	4
No opinion	21

"Do you think we have done a good job or a poor job in handling our occupation of Germany?"

	Pct
Good	31
Fair	24
Poor	21
No opinion	24

The principal criticisms of the German occupation, judging by comments from the people polled, are that the administrative job is being handled too leniently, that demobilization of the armed forces has resulted in inexperienced youngsters trying to do the job and that there have consequently been poor discipline, rowdyism, and too much fraternization. Some voters say that the divided administration in Germany resulting from occupation zones has contributed greatly to the confusion, although this of course is not a criticism of the American zone in particular.

People incline to like about our job in Japan the "excellent" leadership of MacArthur. By far the largest number of comments deal with MacArthur and his personal leadership. People also mention the lack of trouble in Japan. So far as they have been able to see, they say, everything is going very smoothly. There is evidence, they point out, of a successful effort at democratizing Japan—witness that women recently went to the polls. Finally, people point out that there has been little interference with MacArthur, "a unified command," as contrasted to Germany, with its zones of occupation.

War veterans are less satisfied with the German occupation than civilians are. Veterans and the general public feel alike in the occupation of Japan.

The vote of veterans and civilians on the German occupation follows:

German Occupation	Veterans Pct	All Others Pct
Good	23	32
Fair	27	24
Poor	40	18
No opinion	10	26

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• • • **In the opinion** of the average American, Russia is out to do far more than strengthen her defenses and secure her borders against attack.

Only three persons out of ten find that a satisfactory explanation for Russia's course in international affairs.

A clear majority are convinced that Soviet intentions are imperialistic, that Russia is trying to build herself up to be the ruling power of the world.

The general public reaction to Russia's course in international affairs is indicated when interviewers for the institute put this question to a true cross-section of voters from coast to coast.

Voters Believe Better Job Is Being Accomplished in Japan Under MacArthur's Command

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"As you hear and read about Russia these days, do you believe Russia is trying to build herself up to be the ruling power of the world, or is Russia just building up protection against being attacked in another war?"

The vote:

	Pct
Ruling power	58
Protection	29
No opinion	13

This widespread belief in Russian imperialism has persisted for some months. In March when voters were asked whether they thought any nation was trying to dominate or run the world, the majority answered in the affirmative and the largest number named Russia as the nation they had in mind.

A breakdown of replies on the basis of occupations finds the manual worker and the farmer revealing the great proportion of distrust of Russia's aims.

This is shown as follows:

	Ruling Power	Protection	No Opin.
Prof. & Business	Pct	Pct	Pct
Groups	52	36	12
White collar	55	33	12
Farmers	59	29	12
Manual workers	60	26	14

The average American is against appeasing Russia in what it supposes to be its design for expansion of power. When the country was polled in March on the question of what the United States should do if Russia continues her present course in world affairs, the weight of opinion was heavily on the side of being firm, of insisting that Russia live up to her agreements, and of offering that country no appeasement.

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ONE OF THE BEST: *Machine tool builders were amazed at the show put on for them by the officers and crew of the* U. S. S. Midway.

o o o

Navy-Air Displays Power In Exciting Show for Tool Builders

At Sea

• • • **Wheeeeee**—a tiny plane with an 8-ft wingspan hurtles along the catapult and climbs swiftly into the kodachrome sky. On the flight deck, a pilot with a control box, no bigger than a couple of cigarette packs, manipulates a miniature joystick, governing the movements of the plane as accurately as though he were actually seated in it. When scarcely more than a speck in the sky, the drone, as it is officially called, banks sharply and comes hurtling down in a simulated bombing attack. Quadruple barrel 40 mm guns swing into position under the influence of radar controls, and then split the air with a harsh staccato bark. Streams of tracer shells cross and recross, but mysteriously the plane comes through unscathed, swoops triumphantly over the carrier and whirls out to sea again. A few moments later a second attack is made, and again the guns bark, but this time, there is a burst of white flame as a shell lands home; one wing disappears, and the plane spins down to vanish beneath the waves in a smother of foam.

A second drone takes off, and this time it is the 5-in. guns that roar. Great bursts of orange flame leap from the ship's sides, and the air is filled with the stink of burning powder. Shells burst with a faint crack and sully the blue sky with puffs of dirty black smoke. Then one puff swells suddenly and dissolves into lurid flame: A direct hit. The plane disappears completely, and only a few small splashes show where fragments rain into the sea.

This was only one of many such experiences shared by 21 members of the National Machine Tool Builders Assn. during a two-day cruise on the aircraft carrier U. S. S. *Midway* as guests of the U. S. Navy and Rear Admiral Cassady. Boarding the carrier at Gravesend Bay, N. Y., the guests were welcomed aboard by Rear Admiral Cassady and Capt. H. S. Duckworth, and after being assigned to staterooms, were assembled for a lecture on gunnery by Lt. Comdr. R. H. Buckley, the ship's gunnery officer. During the afternoon the air group was launched by both catapult and standard take-off, and made a coordinated attack on a sled towed astern, using 5-in. rockets. This was followed by a most impressive aerial snake dance in which almost every evolution capable of being made by an aircraft was performed by a line of some 30 or more planes. After all planes had landed, a motion picture was shown, demonstrating the methods of fire fighting aboard ship.

Guests were given complete freedom of the ship, and even the most holy of holies, the Admiral's bridge was open as a vantage ground for observing operations. Without a single exception, every officer and enlisted man proved universally courteous and helpful, and no landlubber's foolish question went unanswered. Even such boners as calling a ladder a stair, or referring to topside as upstairs, failed to bring down the wrath of the gods, and while there were many barked shins from hatch coamings, and many bumped heads from low passageways, no one went unwarned of these hazards. Scarcely a compartment in the entire ship was not invaded by guests, escorted or unescorted, and even the mysteries of the radar room were demonstrated and explained.

One of the escorting destroyers was refueled at sea in a beautiful exhibition of seamanship on the part of both skippers. Lectures were given on aviation medicine and damage control; boiler rooms and engine rooms were explored, and even the mechanism of the steering gear in the very stern of the ship came in for its share of attention.

Those comprising the party on this most memorable trip were: Creighton Audette, assistant sales manager, Cone Automatic Machine Co.; Joseph B. Johnson, vice-president, Bryant Chucking Grinder Co.; A. B. O'Donnel, sales manager, Arter Grinding Machine Co.; H. E. Linsley, machine tool editor, THE IRON AGE; H. H. Pease, president, New Britain Machine Co.; L. B. Portman, Portman Machine Tool Co.; F. G. Silva, vice-president, Davenport Machine Tool Co.; G. L. Todd, vice-president, The Bullard Co.; P. L. Armstrong, secretary, Sheldon Machine Co., Inc.; E. T. Benninghoff, vice-president, The Pipe Machinery Co.; J. A. Bradner, sales manager, The Lees Bradner Co. Also D. W. Champlin, vice-president, Defiance Machine Co.; F. J. Fields, vice-president, The Sidney Machine Tool Co.; A. M.

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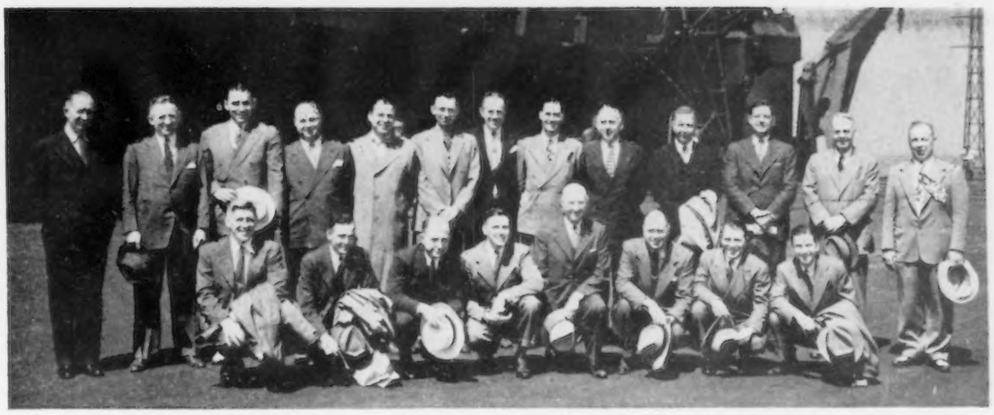

GLAD TO BE ABOARD: *Left to right, rear row, E. T. Benninghoff, W. K. Bailey, G. J. Rutenschroer, F. J. Fields, G. A. Espy, J. A. Bradner, H. L. Tigges, D. A. Patterson, J. B. Johnson, P. L. Armstrong, G. L. Todd, H. H. Pease, A. B. O'Donnel. Front row, H. E. Linsley, F. G. Silva, S. A. Woleben, C. O. Audette, A. M. Johnson, L. B. Portman, P. Polk, D. W. Champlin.*

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Johnson, president, Barnes Drill Co.; P. Polk, vice-president, The Sheffield Corp.; W. K. Bailey, vice-president, Warner & Swasey Co.; S. A. Woleben, secretary, Armstrong Blum Mfg. Co.; H. L. Tigges, vice-president, Baker Bros., Inc.; G. J. Rutenschroer, secretary, The Boye & Emmes Machine Tool Co.; G. A. Espy, G. Andrew & Espy; and D. A. Patterson, secretary, The Avey Drilling Machine Co.

All arrangements were made by Tell Berna of NMTBA, and were carried out without a single hitch. Two similar parties were conducted on the *Midway's* sister ship, the U. S. S. *Franklin D. Roosevelt*, and on the U. S. S. *Princeton*. Planned as a gesture of appreciation by the Navy for the splendid work done by the machine tool manufacturers in providing the tools for victory, these cruises made a never-to-be-forgotten impression on all those concerned by permitting them to see for themselves the greatness, the power and the efficiency of the U. S. Navy.

Chemists Association Elects New Officers At June 6 Convention

Skytop, Pa.

• • • **The Manufacturing Chem**ists Assn. of the U. S. elected officers and 15 executive committee members at its annual meeting here on June 6.

Charles S. Munson, chairman of the executive committee, U. S. Industrial Chemicals, Inc., was elected president to succeed H. L. Derby, president of the American Cyanamid & Chemical Corp.

Leonard T. Beale, president of the Pennsylvania Salt Manufacturing Co., Philadelphia, and H. O. C. Ingraham, vice president of the General Chemical Co., were elected vice presidents.

J. W. McLaughlin, Carbide & Carbon Chemicals Corp., was named treasurer, and Warren N. Watson, Washington, D. C., was re-elected secretary of the Association, which maintains its headquarters in Washington.

The Association, an organization of some 80 chemical corporations, elected the following executive committee:

George W. Merck, president of Merck & Company, chairman; Lammot du Pont, chairman of E. I. du Pont de Nemours, vice chairman; Mr. Derby; C. S. Hosford, Jr., president of the Victor Chemical Works; John L. Smith, president of Charles Pfizer & Company, Inc.;Clyde D. Marlatt, vice president of the Martin Dennis Co.

W. S. Landes, vice president of the Celanese Corp. of America; P. T. Sharples, president of Sharples Chemicals, Inc.; H. I. Young, president of American Zinc, Lead & Smelting Company; and William M. Rand, president of Monsanto Chemical Co.

MDNA Elects Officers

Atlantic City, N. J.

• • • **At a recent** meeting of the Machinery Dealers' National Assn. the following officers were elected for 1946-47:

President, Harvey H. Goldman, Detroit; first vice-president, George McClennen, Delta Equipment Co., Philadelphia; second vice-president, Joseph T. Weiss, Interstate Machinery Co., Inc., Chicago; treasurer, Charles Simmons, Sr., Simmons Machine Tool Corp., Albany; past president, R. A. Vine, Detroit.

Chapter Chairmen: Chicago, Victor Segal, Victor Machinery Co.; Detroit, Robert Brown, Robert F. Brown, Machinery; New York, E. S. Wiener, Wiener Machinery Co., Inc.; New England, Charles Smith, Nutmeg State Machinery Corp., New Haven; Philadelphia, J. E. Middleton, L. F. Seyfert's Sons, Inc.

Directors: Elected for 2 yr in 1945—(Term expires 1947). Sidney Kriser, Industrial Plants Corp., New York; Ralph Hochman, Ralph Hochman & Co., Newark; Joseph Hurwitz, Cook County Machinery Co., Chicago; John Green, Lafayette, Machinery Co., Detroit.

Elected for one year: Harry King, Los Angeles; D. E. Dony, Dony Machinery Co., Rochester, N. Y.; Frank Lunney, Philadelphia; Phillip Noll, Sr., Noll Equipment Co., Cleveland.

Ship Steels Exported

Washington

• • • **WAA has announced** the sale of approximately 40,000 tons of heavy steel strip plates and structurals to be used for the construction of small type vessels, to the Italian Government for about $2,000,000. Located on the West Coast the material was in excess of normal requirements of that area and transportation costs to the East were prohibitive, WAA said. A similar quantity of this material was recently sold to the Netherlands.

Pleas of Producers Granted As OPA Ups Prices of Many Mill Products

Washington

• • • **Formal announcement** of increased prices of alloy steel products, nails, bale tie wire, steel screen wire cloth and pipe and oil country tubular goods was made by OPA on June 11. In addition, the schedule of extras set up for hot and cold-rolled steel sheets and strips of rimmed stock steel was modified so as to extend them to drawing quality in these products. The changes were made immediately effective, some of which have been previously reported in THE IRON AGE.

The alloy steel products change replaced the 4 pct in maximum prices granted last Mar. 1, with a 8.2 pct increase, a net advance of 4.2 pct.

The price of nails was increased to $10 a ton.

The price of bale tie wire was increased by eliminating the required discount of 20¢ per 100 lb.

The price of 18x14 mesh screen cloth was increased 11.25 pct with proportionate increases provided for all other sizes. Maximum prices for all sizes of screen wire cloth except 18x14 were increased last Mar.

The change in the pricing of pipe and oil country goods restores the customary practice of using a list price and discount system. OPA said that it is designed to end the difficulties and confusion that have resulted in a few cases from the dollar per ton increases. It was added that this changing of applicable discounts will result in price increases in some cases and in reductions in others but will increase the general level of maximum prices.

The new list of extras provided for drawing quality in uncoated or coated hot and cold-rolled carbon steel sheets and strips — 12 gage and heavier, 15¢ per 100 lb; 13 gage to 21 gage, 25¢ per 100 lb; and 22 gage and lighter, 35¢ per 100 lb—may be charged only when drawing and meeting other specified requirements.

OPA said that the increases in prices were made possible through savings made because of the inability of tin mill products to take advantage of the general steel price increase of $5 granted by the OES directive of Mar. 1. Tin mills were unable to benefit from that increase because of existing long-term contracts.

OPA said that the increased percentage granted to alloy steel products was necessary because the former 4 pct fell far short of compensating producers for their increased labor costs. On the average, it was stated, labor costs are a much larger factor in the production of alloy steels than for carbon steels and the total increase about averages the increases given carbon steel products.

The additional increase in the price of wire nails was granted when it was found that the former increases were inadequate. OPA twice previously granted base price increases of $7 each, the last, Mar. 1. The $10 increase just granted brings the base price of nails up to $75 a ton, 47 pct above their base price of $51 a ton.

In addition to OPA and CPA ac-

Summary of New Steel Facilities

Company	Location	Type of Equipment	Annual Capacity	Cost	Reference
Allegheny-Ludlum Steel Corp.	Pittsburgh	Building of cold rolling mill of latest design for rolling stainless and silicon strip steels	———	———	THE IRON AGE 9-6-45 p. 112
Bethlehem Steel Co.	Sparrows Point	Cold-rolled sheet	360,000 tons	———	THE IRON AGE 4-4-46 p. 128
Carnegie-Illinois Steel Corp.	Gary	2 slab heating furnaces and rebuilding 3 existing slab heating furnaces	105 tons per hr capacity	———	THE IRON AGE 2-28-46 p. 106
Carnegie-Illinois Steel Corp., Gary Sheet & Tin Mill	Gary	Cold-rolled sheet	Will increase capacity approx. 104,000 tons	———	THE IRON AGE 6-21-45 p. 104
Carnegie-Illinois Steel Corp., Gary Sheet & Tin Mill	Gary	Increase in capacity of 80-in. hot strip mill; new 54-in. 4-stand cold reduction mill; improvements on 84-in. 3-stand cold reduction mill; new coating facilities; additional annealing capacity for large coils; further improvements in handling and processing methods	Increase in cold reduction capacity: 232,500 tons, boosting mill's annual capacity to 1,250,000 tons*	Cost not revealed. Estimate based on earlier announcements for postwar improvements in Gary plants more than $50 million	THE IRON AGE 11-22-45 p. 112
Carnegie-Illinois Steel Corp., Irvin Works, Vandergrift Plant	Vandergrift, Pa.	Facilities for production of silicon steel strip in coils, including transfer of a single stand reversing cold reducing mill from Irvin to Vandergrift and installation of necessary annealing and other finishing facilities	———	"Several millions"	THE IRON AGE 11-15-45 p. 109
Carnegie-Illinois Steel Corp., Irvin Works	Pittsburgh	For cold-reduced tinplate	Will increase capacity approximately 129,000 tons	———	THE IRON AGE 6-21-45 p. 104
Great Lakes Steel Corp.	Ecorse, Mich.	Cold rolling mill	———	$1 million	THE IRON AGE 1-31-46 p. 122
Inland Steel Co.	———	Strip mill	480,000 tons	$12 million	STEEL 4-29-46 p. 61
Jessop Steel Co.	Washington, Pa.	Sendzimir cold-rolled strip mill and auxiliary equipment	———	———	THE IRON AGE 1-10-46 p. 142
Jones & Laughlin Steel Corp.	Aliquippa, Pa.	Five-stand 4-high 42-in. cold reduction mill Pickling and annealing facilities to complement increased cold-reduced sheet ouiput	———	$12 million*	THE IRON AGE 8-2-45 p. 103
Jones & Laughlin Steel Corp.	Cleveland	Equipment to increase sheet capacity	———	$3 million	THE IRON AGE 8-2-45 p. 103

tions the latter has set up specific goals for all manufacturers of nails. The Office of International Trade, Dept. of Commerce, has placed building nails under export control at the request of NHA and CPA to provide additional nails for domestic use, particularly the Veterans' Housing program. The production goal set up at the request of Housing Expediter Wilson W. Wyatt calls for not less than 55,000 tons in June and increasing to at least 66,000 tons per month by Sept.

Jobbers of bright wire nails may continue to determine their ceiling prices by applying the dollar-and-cent mark-ups per keg listed in the regulation (Revised Supplementary Reg. 14) providing modifications of maximum prices established by the base period "freeze" action (General Maximum Price Reg.). Retailers of these nails may also continue to fix their prices to conform with their dollar-and-cent price schedule (Supplementary Order 151).

Jobbers of galvanized nails may determine their new ceiling prices by adding dollar-and-cent mark-ups over costs specified in the regulation covering resales of these products (Revised Price Schedule 49). However, retailers of galvanized nails must continue to sell them at base date "freeze" levels. These resale provisions are being studied by the price agency and may be changed soon, OPA said.

Resellers of screen cloth may continue to fix their maximum prices as formerly. Jobbers may use the percentage mark-up over costs in their regulation covering the resale of iron or steel products (Revised Price Schedule 49). Retailers will use the specified percentage mark-ups over costs in the OPA order covering sales at that level (Supplementary Order 151).

Company	Location	Type of Equipment	Annual Capacity	Cost	Reference
Republic Steel Corp.	Niles, Ohio	Additional annealing capacity for strip in tinplate plant, for cold reduced blackplate	———	$335,000	THE IRON AGE 8-2-45 p. 97
Republic Steel Corp.	Youngstown	Building additions: Two 4-high stands, 1 coiler, furnace and auxiliary equipment at the plate mill; a heavy duty vertical edging stand 16 in.	———	Approximate cost of project to augment production of bars and shapes: $107,000	THE IRON AGE 8-2-45 p. 97
Republic Steel Corp.	Massillon, Ohio	Equipment for cold rolling, pickling, annealing and cleaning. Slitting units with coilers and tractors: construction of a minor substation	———	$943,000	THE IRON AGE 8-2-45 p. 97
Republic Steel Corp.	Cuyahoga Valley, Ohio	7 coil annealing furnaces—2 sheet annealing furnaces—2 extensions to cold mill building to house furnaces	Additional annealing capacity—120,000 tons	$1,090,000*	THE IRON AGE 8-2-45 p. 97
Republic Steel Corp.	Cleveland	Multiple slitting machine with accessories to increase strip production	———	$150,000	THE IRON AGE 8-2-45 p. 97
Republic Steel Corp.	Niles, Ohio	Plant addition for annealed strip production	———	$863,000*	THE IRON AGE 8-2-45 p. 97
Rustless Iron & Steel Corp.	Baltimore	Relocation and improvements of hot-rolling facilities to produce larger variety of sizes of stainless steel rods	———	$1,370,000	THE IRON AGE 9-6-45 p. 136
Rustless Iron Steel Corp.	Baltimore	Rearranged and enlarged cold-rolled shape mills	———	$400,000	THE IRON AGE 9-6-45 p. 136
Tennessee Coal, Iron & Railroad Co.	Fairfield, Ala.	Increase in capacity of tinplate mill and installation of feeders and cleaners for 28 tin stacks	Increase of 52,000 tons	———	THE IRON AGE 6-21-45 p. 104
U. S. Steel Corp. Columbia Steel Co.	Pittsburg, Calif.	Installation of cold reduction facilities	More than 325,000 tons	Probable initial expense $25 million	THE IRON AGE 8-16-45 p. 88
Weirton Steel Co.	———	Tinplate expansion 4 annealing furnaces and 12 bases representing a 20 pct expansion	To increase present capacity by 50 pct	———	THE IRON AGE 3-14-46 p. 124
Weirton Steel Co.	Weirton, W. Va.	New tandem cold reduction mill: 4-high, 5-stand unit for rolling lighter gages of strip steel	———	———	THE IRON AGE 7-12-45 p. 89
Youngstown Sheet & Tube Co.	Campbell, Ohio	Large addition to cold rolling mill	Additional capacity: 200,000 tons	———	THE IRON AGE 9-27-45 p. 96
Youngstown Sheet & Tube Co.	Youngstown	Cold-rolled sheets	10,000 tons	———	THE IRON AGE 4-4-46 p. 128

*Approximate

PEI Will Hold Forum On New Developments

Pittsburgh

• • • **Improved methods** of metal fabricating, enamel processing, and shop control will be featured at the 8th annual forum of the Porcelain Enamel Institute, set for Oct. 9-11, at the University of Illnois. Primary purpose of the forum is to provide useful and usable information on new developments, materials, methods and equipment that contribute to manufacturing efficiency.

The 1946 program will include papers and discussion of the following: Symposium on Cleaning and Pickling Equipment and Practice; Atomic Hydrogen Welding; Enamel Shop Housekeeping; Safety in the Enamel Plant. Symposium on Tests and Test Methods; Practical Test Methods for Shop Use; Enamel Shop Production Problems; Use of Portable Conveyors; Firing Ground Coats and Cover Coats Together; Deenameling; Decorative Processes for Porcelain Enamel; New Angles on Reclaimed Enamels; Problems in Porcelain Enameling Nonenameling Sheets.

Chairman of the Forum committee is F. E. Hodek, Jr., of the General Porcelain Enameling and Mfg. Co., Committee members include: A. I. Andrews, University of Illinois; J. E. Hansen, Ferro Enamel Corp.; R. M. King, Ohio State University; L. E. Nordholt, Tennessee Enamel Mfg. Co.; F. A. Petersen, University of Illinois; E. H. Shands, Geo. D. Roper Corp.; and N. G. Wedemeyer, Rohm and Haas Co.

Copper, Lead Subsidy Payments Cut by OES

Washington

• • • **Slashing of** subsidy payments on copper and lead by the amount of recent ceiling prices granted on these metals by OPA has been ordered by the Office of Economic Stabilization. OES also took steps to recapture from mines which have been receiving subsidies, any windfalls resulting from the price increases and acted to revise mine production quotas where necessary to maintain current mine operating margins. The premium reduction on lead became effective June 3. The reduction on copper was effective on the date an operator entitled to receive the subsidy was authorized to increase his ceiling price.

These actions were provided for in OES Directive 119 to OPA, CPA, RFC and the Quota Committee for the Premium Plan for Copper, Lead and Zinc.

Copper ceiling prices were increased from 12¢ to 14⅜¢ per lb, and lead ceiling prices from 6½¢ to 8¼¢ per lb, effective in most cases on June 3, 1946. By reducing the basic copper subsidy from 5¢ to 2⅝¢ per lb and the basic lead subsidy from 2¾¢ to 1¢ per lb, the total basic return per pound for subsidy-receiving mines continues at 17¢ for copper and 9¼¢ for lead. These returns, said OES, are "generally adequate to maintain production."

The RFC was directed to recapture 2⅜¢ per lb on copper and 1¾¢ per lb on lead for every pound of the metal in an operator's inventory unsold on the effective date of the price increases and for which subsidies had been paid or had accrued up to that date. The metals are deemed to be in an operator's inventory whether held by him in finished form, or in process in his mills, smelters or refineries, or in the form of copper and lead due him from other treatment plants.

AMERICAN IRON AND STEEL INSTITUTE
CAPACITY, PRODUCTION AND SHIPMENTS
Period APRIL - 1946

Steel Products	Number of companies	Items	Maximum Annual Potential Capacity Net Tons	Current Month: Production Net Tons	Current Month: Production Per cent of capacity	Current Month: Shipments (Net Tons) Total	Current Month: Shipments (Net Tons) To members of the industry for conversion into further finished products	To Date This Year: Production Net Tons	To Date This Year: Production Per cent of capacity	To Date This Year: Shipments (Net Tons) Total	To Date This Year: Shipments (Net Tons) To members of the industry for conversion into further finished products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	39	1	xxxx	xxxx	xxx	314,037	146,161	xxxx	xxx	1,036,502	500,289
Structural shapes (heavy)	12	2	9,421,550	313,555	42.6	340,055	xxxx	898,553	30.4	944,443	xxxx
Steel piling	4	3		16,779		12,580	xxxx	42,460		33,863	xxxx
Plates (sheared and universal)	27	4	17,080,770	358,745	25.5	383,584	22,373	1,151,779	20.5	1,151,223	78,446
Skelp	5	5	xxxx	xxxx	xxx	41,504	20,529	xxxx	xxx	124,061	52,441
Rails—Standard (over 60 lbs.)	4	6	3,657,000	153,126	50.9	152,385	xxxx	460,208	38.3	453,923	xxxx
—All other	5	7	392,000	11,807	36.6	13,575	xxxx	38,642	30.0	38,457	xxxx
Splice bars and tie plates	12	8	1,745,960	62,518	43.5	66,931	xxxx	176,417	30.7	190,777	xxxx
Track spikes	10	9	349,400	13,031	45.3	13,926	xxxx	38,477	33.5	41,681	xxxx
Hot Rolled Bars—Carbon	33	10	xxxx	593,758	xxx	497,859	59,269	*1,862,986	xxx	1,548,646	203,442
—Reinforcing—New billet	14	11	xxxx	83,901	xxx	85,339	xxxx	* 240,491	xxx	262,298	xxxx
—Rerolled	12	12	xxxx	6,569	xxx	9,760	xxxx	34,372	xxx	* 37,101	xxxx
—Alloy	22	13	xxxx	161,773	xxx	130,868	14,618	430,418	xxx	348,154	37,050
—Total	39	14	21,906,660	846,001	46.9	725,826	73,887	2,568,267	35.6	*2,196,199	240,492
Cold Finished Bars—Carbon	24	15	xxxx	124,057	xxx	122,893	xxxx	370,079	xxx	369,175	xxxx
—Alloy	23	16	xxxx	20,087	xxx	18,207	xxxx	59,123	xxx	52,396	xxxx
—Total	31	17	* 2,851,510	144,144	61.4	141,100	xxxx	429,202	45.8	421,571	xxxx
Tool steel bars	18	18	255,010	10,049	47.9	10,113	xxxx	32,075	38.2	31,459	xxxx
Pipe & Tubes—Butt weld	14	19	2,176,520	136,058	76.0	130,511	xxxx	381,436	53.3	371,416	xxxx
—Lap weld	9	20	730,200	30,714	51.1	32,148	xxxx	78,092	32.5	87,119	xxxx
—Electric weld	10	21	1,536,900	74,545	58.9	60,944	xxxx	202,636	40.1	169,687	xxxx
—Seamless	13	22	3,169,600	214,320	82.2	176,714	xxxx	594,710	57.0	523,922	xxxx
—Conduit (cap. & prod. incl. above)	6	23	xxxx	xxxx	xxx	9,062	xxxx	xxxx	xxx	24,970	xxxx
—Mech. tubing (cap. & prod. incl. above)	11	24	xxxx	xxxx	xxx	47,883	xxxx	xxxx	xxx	121,088	xxxx
Wire rods	25	25	7,295,670	414,508	69.1	95,954	35,341	1,198,289	49.9	298,963	109,702
Wire—Drawn	39	26	* 5,702,890	319,359	68.1	182,127	13,894	928,205	49.5	530,894	38,348
—Nails and staples	18	27	1,260,360	54,071	52.1	55,620	xxxx	155,449	37.5	155,036	xxxx
—Barbed and twisted	15	28	543,610	21,106	47.2	21,180	xxxx	61,848	34.6	60,472	xxxx
—Woven wire fence	15	29	1,121,860	36,556	39.6	37,318	xxxx	112,936	30.6	113,514	xxxx
—Bale ties	12	30	149,700	7,851	63.7	8,276	xxxx	21,336	43.3	23,142	xxxx
Black Plate—Ordinary	9	31	xxxx	xxxx	xxx	68,408	104	xxxx	xxx	232,879	665
—Chemically treated	8	32	465,000	12,679	33.1	13,988	xxxx	43,531	28.5	42,562	xxxx
Tin and Terne Plate—Hot dipped	9	33	3,758,850	162,935	52.7	170,910	xxxx	477,242	38.6	531,989	xxxx
—Electrolytic	9	34	2,231,850	91,474	49.8	93,821	xxxx	234,206	31.9	248,596	xxxx
Sheets—Hot rolled	30	35	19,353,320	1,230,095	77.2	550,724	33,172	3,675,919	57.7	1,609,016	114,944
—Cold rolled	13	36	7,127,460	448,763	76.5	325,609	xxxx	1,449,227	61.8	1,036,626	xxxx
—Galvanized	16	37	2,924,130	134,792	56.0	129,374	xxxx	413,655	43.0	410,141	xxxx
Strip—Hot rolled	25	38	7,180,030	196,085	33.2	117,304	16,926	644,341	27 3	418,944	63,097
—Cold rolled	34	39	* 3,067,450	127,770	50.6	118,200	xxxx	365,680	36.2	359,641	xxxx
Wheels (car, rolled steel)	5	40	315,400	22,852	88.1	24,246	xxxx	68,748	66.3	* 72,857	xxxx
Axles	6	41	398,170	11,891	36.3	13,569	xxxx	34,814	26.6	35,050	xxxx
All other	3	42	169,510	4,480	32.1	575	xxxx	13,902	24.9	* 1,408	xxxx
TOTAL STEEL PRODUCTS	140	43	xxxx	xxxx	xxx	4,698,081	362,387	xxxx	xxx	*14,144,091	1,198,424
Effective steel finishing capacity	140	44	64,059,000	xxxx	xxx	xxxx	xxxx	xxxx	xxx	xxxx	xxxx
Percent of shipments to effective finishing capacity	140	45	xxxx	xxxx	xxx	82.3 %	xxxx	xxxx	xxx	61.4%	xxxx

During 1945 the companies included above represented 98.4% of the total output of finished rolled steel products as reported to American Iron and Steel Institute.

Maximum Annual Potential Capacity: Embraces the total tonnage of each product that could be produced under full operations assuming exclusive use of all available facilities and without regard to the availability of ingots. For those types of rolling mills and other producing facilities which produce more than one product, the full capacity for each product is shown, regardless of the fact that such producing facilities have not capacity to produce the aggregate tonnage shown for all such products. As an illustration, for a continuous strip-sheet mill producing both plates and sheets, the full capacity of the mill to produce each product is included, regardless of the other product.

* Adjusted.

The London ECONOMIST

The Ruhr in Spring

Reprinted by special permission to further understanding on how political and economic affairs are viewed in London.

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IT would be fatally easy to be deceived by first appearances in the Ruhr at this moment. An area which has been compared to the Black Country in England because of its heavy concentration of industry bears no resemblance to it topographically. This dissimilarity is accentuated in spring by the sea of green which laps round the towns, making them appear as dark islands in a well-cultivated countryside. Its green arms even stretch into the ruins, so that much of their bare ugliness is concealed.

Instead of running mile after mile through smoke blackened streets with one town merging imperceptibly into the next, and with only a few fields and trees to bear witness to the existence of nature, the towns of the Ruhr have preserved an easy contact with the countryside; it separates most of them by belts of woods, fields and allotments in which every yard of ground is cultivated with intense care. The ratio of country to town in the Ruhr is insufficient to provide any substantial contribution to the feeding of the large urban populations within it, but it does provide the possibility of black market operations close at hand for those who can afford them, and an easy escape from the everyday sights of destruction.

The first startling thing that strikes the foreign traveller is the healthy appearance of the people in the streets, even in such heavily bombed towns as Essen and Dortmund, where the food situation is extremely bad. The first reaction is to think that the reports about the food situation have been grossly exaggerated. Many of the people walk with normal energy, are dressed nearly as well as in England, and look as well covered; the sunburn of six weeks of good weather contributes to their healthy appearance; the children jostle each other happily tumbling out of school; the devastation of the streets has become so habitual to them as to pass unnoticed.

BUT to be deceived by such appearances would be to be guilty of the grossest superficiality. For the sick and starving stay at home. The heavy workers have not the leisure to wander round the streets; beneath the top dressing of clothes the physique of many has seriously suffered. For instance, in the mines in Essen the average weight of the miners has dropped severely over the last year, and more sharply for those miners working and living in the central heavily bombed areas than for those on the outskirts. Whereas 45 pct of the miners in the former area are below the normal average weight for their age group, only 36 pct are below the normal average outside the town where food is easier to come by.

Similarly, visits to factories or mines provide a very different picture of the general level of health. The evidences of hunger are rarely dramatic, or startling. But yellow faces and shrunk cheeks are frequent. The management of a locomotive repair shop reckoned that output per man was about half of that before the war, and these were men on the heavy workers' ration of 2200 calories a day, compared with 1000 for the ordinary worker. The output of the workers underground in the mines, who receive 2800 calories a day is now 1.14 tons a shift and this is considered to be about the maximum which could be produced on this quantity of food. It was 2.162 tons in 1936.

Nevertheless the success with which the Germans have so far survived their deprivations must be the cause of surprise. Undoubtedly many families had accumulated reserves, but these must be almost exhausted. After being for 6 yr the best fed nation in Europe the effects of starvation have been delayed. But it is clear enough that black-market operations have provided a cushion for those who have goods to exchange or substantial reserves of cash.

IN a country with so large a number of small farms the tight control of supplies from producers to consumers is extremely difficult. As evidence of the unofficial sources of supply every bicyclist on the road has a large bundle on his carrier, and the trains, especially at weekends, overflow with people bringing home potatoes, vegetables or any other food they have been able to secure from the farmers. Potatoes are now no longer available on the ration. They are still on the passenger trains. Indeed these trains are one of the most pathetic sights of Germany with the steps and buffers crowded with men and women hanging perilously to each chain and bar, and in imminent danger of losing their footholds.

A visit to a fee-paying secondary school, where most of the parents were well-to-do, showed up the possibilities of acquiring food outside the rations, for many of the children differed little in health and dress from their counterparts in England. In a mining village absenteeism due to illness was only about 3 pct, but the children were thinner than they should have been, bare feet or home-made wooden-soled sandals were frequent—a bad omen for next winter—and overcrowding so serious as to necessitate double-shift working and an appallingly high ratio of children to staff.

In the center of the towns health has deteriorated further: A clinic of 100 beds opened recently for miners' children in the center of a severely bombed area was filled at once by cases suffering from severe malnutrition. Such is the crescendo of hunger in which three main factors play their part, wealth, accessibility to the countryside, and the

(CONTINUED ON PAGE 156)

Industrial Briefs . . .

• CHANGE OF ADDRESS — The San Francisco branch-warehouse of the Crucible Steel Co. of America has moved its offices and facilities to 2050 Bryant St., San Francisco, 10.

• BUYS PROPELLER PLANT — Borg-Warner Corp., Chicago, has purchased the former A. O. Smith Corp. propeller plant on the western outskirts of Milwaukee for a reported price of $1,500,000 from the War Assets Administration and will operate it for production of automatic automobile transmissions with a probable employment of close to 3000 persons.

• HEADS CHEMICAL DEPT.—Dr. F. D. Richardson, one time Commonwealth Fellow at Princeton University, has been appointed head of the chemistry dept. of the British Iron & Steel Research Assn. His researches have been in physico-chemical fields, and in the earlier part of the war in H.M.S. Vernon he was associated with development of equipment for sweeping magnetic mines.

• BUYS FOUNDRY—The Barium Steel Corp. announces acquisition of the Detroit Steel Casting Co., producers of carbon and alloy steel castings of Detroit. The acquisition adds another branch of the steel industry to the Barium organization in line with its plan to complete a self-contained and economic unit for the manufacture of various steel products.

• BUDD MERGES—An $80,000,000 corporation to be known as The Budd Co. will result from the merger of the Edward G. Budd Mfg. Co. and the Budd Wheel Co., both Pennsylvania corporations. The new company will own all assets and business, and will be subject to all liabilities of the two former companies. The Budd Co. will be operated in four principal divisions, automobile body, railway, wheel and induction heating.

• BUYS ARMOR PLATE PLANT—Henry Disston & Sons, Inc., have purchased the wartime Philadelphia Armor Plate Plant No. 1 for the cash sum of $300,000 it has been announced by WAA. This plant is directly adjacent to other Disston property in the Quaker City. The firm will adapt the plant to the manufacture of hand tools as well as continued experimental work on armor plate.

• SELLS WAR PLANT — WAA has announced the sale to Isaacson Iron Works of Seattle for $360,000 the Sundstrand war plant at Rockford, Ill. The new owner has announced that the plant will manufacture tractor equipment.

• APPOINTED DIRECTOR—Joseph R. Barnes has been named director of the industrial relations dept. of the Illinois Manufacturers Assn.

• TO SELL FOUNDRIES—WAA is offering two government-owned steel foundries for sale or lease. One is in Sandusky, Ohio, and the other is in Boston. The Farrell-Cheek Steel Co., foundry in Sandusky has a capacity of 4380 net tons of casting per year. The General Alloys Co., foundry in Boston has a rated capacity of 1200 net tons per year. Also offered for sale or lease is the plant of the Columbian Bronze Co., Freeport, Long Island, with complete facilities for continued use as a foundry or machine shop.

• TO SELL FOUNDRY—The officers and directors of the National Roll & Foundry Company, Avonmore, Pa., voted to discontinue operations in the steel foundry and to concentrate all future activities on the production of iron rolls. The steel foundry plant and equipment is to be offered for immedate sale.

Seek to Restrain Contract Dealings With Mine Foremen

Washington

• • • **Seeking to restrain** the Federal Government from negotiating contracts with the United Mines Workers for the organization of mine supervisory employes into bargaining units, two suits were filed in the United States District Court here on June 13. One was filed by the Jones & Laughlin Steel Corp., which has a case in the courts opposing the National Labor Relations Board's certification of foremen in J&L coal mines in Western Pennsylvania. The corporation also filed a motion for a temporary restraining order. The suit is directed against Secretary of the Interior J. A. Krug; Admiral Ben Moreel, Coal Mines Administrator; UMW President John L. Lewis and the NLRB. A supreme court decision is expected sometime this fall.

The other suit was filed by 122 bituminous coal operators. It is directed against Secretary Krug and Admiral Moreel. Unlike the position of J&L, there has not as yet been any certification for bargaining units for foremen in the mines owned by these operators. Their purpose is to prevent the Coal Mines Administrator from negotiating foremen's contracts.

In the J&L suit the court was told that the NLRB certification is not a legally compulsive adjudication of any right or power of the union to be the exclusive representative of the supervisors. Neither the Secretary of Interior nor the Coal Mines Administrator, it was contended, is bound or permitted by law to accept or act upon the certification unless and until its validity shall have been established in further proceedings before the boards, and if necessary, in the Federal courts.

The 122 operators declared that "for the Government, through its agencies, arbitrarily to enter into any agreement with the union to include, for the purposes of collective bargaining, the supervisory employes of the mines would, in effect, close the door against future legal action by the industry in support of its legal rights in connection with the unionization of mine supervisory people."

Construction Steel...

• • • **Fabricated steel awards** this week included the following:

15,500 Tons, Boston, office building, to Bethlehem Steel Co., Bethlehem, Pa.

3100 Tons, Baltimore, National Gypsum Co., plant to American Bridge Co., Pittsburgh.

975 Tons, Montana, Northern Pacific bridges 33, 36, 40 to American Bridge Co., Pittsburgh.

503 Tons, La Grange, Ill., Electro-Motive Div., power plant, to American Bridge Co., Pittsburgh.

425 Tons, Morris Plains, N. J., laboratory building, to Lehigh Structural Steel Co.

332 Tons, Philadelphia, warehouse to Bethlehem Steel Co., Bethlehem, Pa.

310 Tons, Hartford, Conn., factory to National Steel Co.

300 Tons, Shoals, Ind., Baltimore & Ohio R. R. bridge to American Bridge Co., Pittsburgh.

• • • **Fabricated steel inquiries** this week included the following:

4500 Tons, Belvidere, N. J., Celanese Corp. plant.

2500 Tons, Oaktree, N. J., Dreyfuss office building.

1300 Tons, North Bergen, N. J., Grand City Container Corp., buildings.

1200 Tons, Alameda County Calif., bridge.

900 Tons, Wilmington Calif., main building superstructure, Second Unit, Harbor Steam Plant., Dept. Water & Power, Los Angeles, bids opened June 13.

300 Tons, Burley, Idaho, Snake River Highway bridge.

200 Tons, Newton, Mass., sales and executive offices for United Equipment Co.

• • • **Reinforcing bar awards** this week included the following:

2000 Tons, Delaware Aqueduct, N. Y., Merriman Dam, to Carnegie Illinois Steel Co., through S. A. Healy Co., Chicago, contractor.

105 Tons, Marlborough, Mass., sewerage project to Truscon Steel Co., Boston.

100 Tons, Ludlow, Mass., power plant for Ludlow Mfg. & Sales Co., to Bethlehem Steel Co., Bethlehem, Pa., through Tredennick-Billings Co., Boston, contractor.

• • • **Reinforcing bar inquiries** this week included the following:

670 Tons, Odair, Wash., miscellaneous bars, Bureau of Reclamation, Denver, Inv. G-38, 050-A, bids open June 20.

600 Tons, Wilmington, Calif., main building superstructure, Second Unit, Harbor Steam Plant., Dept. Water & Power, Los Angeles, bids opened June 13.

500 Tons, Lansing, Mich., Michigan State College, science building.

270 Tons, Lansing Iowa, Interstate Power Co., construction.

200 Tons, Lansing, Mich., Michigan State College, home economics building.

200 Tons, Augusta, Mich., Augusta Milling Co., building.

125 Tons, Cook County, Ill., June 11 letting.

100 Tons, Chicago, Automatic Electric Co., building.

100 Tons, Jackson, Mich., Consumers Power Co., building.

• • • **Plate awards** this week included the following:

165 Tons, Hudson, Mass., standpipe to Chicago Bridge & Iron Co., Boston.

150 Tons, Bristol, N. H., standpipe to Chicago Bridge & Iron Co., New York, through Howard E. Bailey Co., Boston, engineers.

110 Tons, Weston, Mass., standpipe to Chicago Bridge & Iron Co., Boston.

Canadian Steelworkers Vote to Strike if Union Demands Are Not Met

Toronto

• • • **Murray Cotterill,** national publicity director of the United Steel Workers of America (CIO), stated that the large majority of union workers in the three major steel plants in Canada, Steel Co. of Canada Ltd., Hamilton; Algoma Steel Corp., Sault Ste. Marie, and Dominion Steel & Coal Co., Sydney, N. S., had voted in favor of a strike if the union demands were not met. The union has given notice that if satisfactory settlement in the steel industry is not reached by June 29, strike action will be taken within 10 days of that date.

Mr. Cotterill stated that the United Steel Workers of America were informed by a "top" WPTB officials that the Apr. 1 increase of $5 per ton in the price of steel provided, in part, for an additional increase in wages. This disclosure came as a reply to a statement by R. A. Gillies. works manager of the Steel Co. of Canada, that the advance in price was "substantially less" than the increase in costs during the war years. The union is asking for a $33.60 minimum wage for a 40-hr week or a general increase of 19½¢ per hr at the Steel Co. of Canada.

Mr. Gillies told employees the company is not prepared to meet the extreme demands of the union, but is willing to discuss a reasonable settlement within the realms of possibility. His statement was made against the background of a government announcement that a commission will be appointed in an attempt to settle the dispute without strike action.

Mr. Cotterill asserted that the Steel Co. of Canada had offered only 5½¢ an hr, which, he said, would bring minimum earnings to $28 for a 40-hr week. The Algoma Steel Corp., Sault Ste. Marie has offered a differential below the Hamilton rate, and the Dominion Steel & Coal Co., Sydney, "has told us that they can't pay us anything at all."

Mr. Cotterill stated that Canadian steel is employing workers at 32¢ an hr less than United States steel and selling the product at the same price.

Coming Events

June 24-28 American Society for Testing Materials, Buffalo.

July 22-23 American Washer & Ironer Manufacturers Assn., French Lick, Ind.

Sept. 10-14 American Chemical Society, exposition, Chicago.

Sept. 11-12 Society of Automotive Engineers, national tractor meeting, Milwaukee.

Sept. 16-20 Instrument Society of America, first conference and exhibit, Pittsburgh.

Oct. 1-4 Iron & Steel Exposition, Cleveland Public Auditorium, Cleveland.

Oct. 3-5 National Electronic Conference, Chicago.

Oct. 3-5 Society of Automotive Engineers, aeronautic meeting and display, Los Angeles.

Oct. 24 American Welding Society, New York.

Oct. 28-30 American Gear Manufacturers Assn., semi-annual meeting, Chicago.

Oct. 29-Nov. 1. Refrigerator Equipment Manufacturers Assn., exposition, Cleveland.

Nov. 7-8 National Founders Assn., New York.

Nov. 18-22 National Metal Congress and Exposition, annual meeting, Atlantic City, N. J.

MACHINE TOOLS

. . . News and Market Activities

Decontrol Would Step Up Competition

• • • **Decontrol of machine tools** will send the industry off to the strongest competition seen in many a day. Firm battle lines have been drawn for some time, and while few definite plans have been revealed as yet, it would appear that the major producers of machine tools will infiltrate the unfettered postwar market quietly at first, raising only those items on which they've been barely breaking even or have discontinued because they couldn't make at a profit under price control.

When and if OPA decontrols machine tools, sources in the industry believe that most builders will follow the broad general pattern which stemmed from OPA's price relief move of a few months ago. Most segments of the industry applied that scale, which was graduated up to 20 pct, with sufficient foresight to discourage cancellations.

In Detroit, despite the fact that large automotive buyers are somewhat removed from the standard equipment market, machine tool volume is holding close to previous levels. The plant of one of the largest producers of special tools in this area is currently closed by a strike, but there is hope that an early settlement will be effected. Deliveries of special machine tools are reported to be very slow, nine months or a year being required where delivery in three to four months was usual. Parts shortages, particularly motors, continue to plague some builders.

In Cincinnati, machine tool market shows little activity or change from last week. Business is continuing at a fair level with all types of machine tools still in some demand. The automobile industry is being watched for anticipated retooling programs and reports of substantial demand in the automobile field continue to float about.

In Philadelphia, it has been reported that there is an estimated machine tool surplus of 300,000 to 400,000 units in the hands of WAA. At the moment these tools are sought by industry in view of their relatively early delivery date. How this factor will cut into the market for new tools is hard to anticipate, but it is known that many surplus tool buyers would prefer new equipment, but are in the market solely for the relatively lower price at which surplus tools are selling and for the better delivery dates.

There is considerable pressure behind a move to force the amendment of Treasury regulations to permit a faster write-off in machine tools in order to permit earlier replacement of obsolescent equipment and allow machine tool users to maintain production efficiency on competitive basis.

Says European Nations Insist on Purchase Of Brand New Machinery

Milwaukee

• • • **While many European** countries, especially France and Russia, are in the market for U. S. machine tools and production equipment, no foreign country has as yet sought to buy our surplus machine tools, Joseph Trecker, executive vice-president, Kearney & Trecker Corp., said here.

J. L. Trecker

"Each country has wanted the newest and best machinery which will produce goods by use of the most modern methods," said Mr. Trecker, who recently returned from a 3-week trip to Europe.

"It is true," he asserted, "that Britain made a deal, under pressure from us, to take over all the lend-lease machinery shipped her rather than send it back here. But this one deal is not important," he added. "Even UNRRA placed orders only for new machines until used machinery dealers made this policy politically hot and UNRRA had to modify its policy."

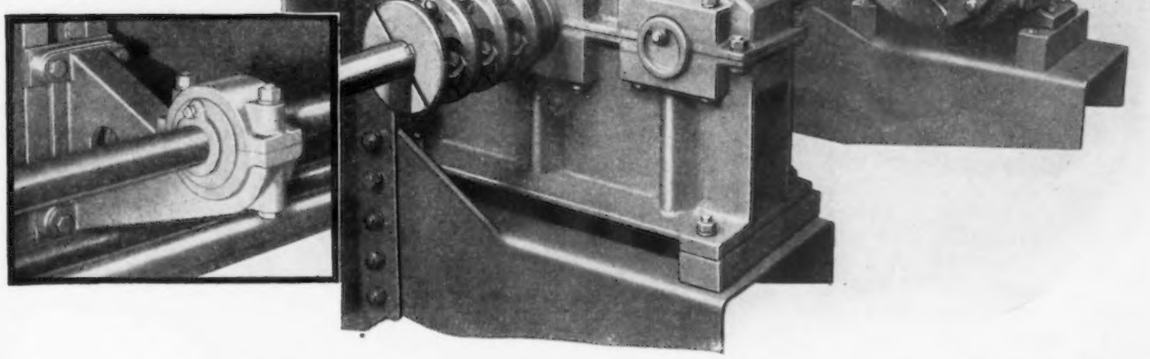
Further substantiating the fact that these countries want nothing but the best and latest machinery available, Mr. Trecker pointed out that at the time of the fall of France, Britain took over the commitments made up to that time by the French Purchasing Commission and for which the French had deposited funds with the manufacturers in the United States. This account today amounts to about $45,000,000, which Britain owes to France for such machinery obtained.

Recently a French corporation has been formed at the suggestion of the British to obtain at least a partial return of this account in the form of used American machine tools in the hands of Britain for distribution to French industry, Mr. Trecker said.

"I do not mean to suggest that Britain is violating the terms of the deal made with the United States for purchase of lend-lease equipment, under which terms Britain guaranteed not to export these machines for a period of five years. However, I do wish to emphasize that the equipment purchased and owned outright by the British over and above lend-lease is being exported to France and other countries as rapidly as possible."

Summing up the European industrial market picture, Mr. Trecker predicted that Russia will buy tens of millions of dollars worth of machinery in this country during the next three or four years, regardless of whether she gets a big loan in Washington. France will buy substantial quantities of machinery as a result of the U. S. loan to her, and will also place some orders for cash. Great Britain will be a good market only for special machinery which she cannot make at home. At the present time, the British machine tool industry is exporting about 50 pct of its output.

BRIDGE DRIVES ...another P&H ADDED VALUE!



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P&H Overhead Cranes provide the best in bridge drive design: single reduction, horizontal gear cases at the center of the span with the second reduction at the drive wheels, preventing wheel thrust from being transmitted into gear train. Alignment is assured by gear case and motor supports of all-welded construction, bolted to the girder at diaphragm points. This low torque bridge drive minimizes girder twist and preserves alignment, making accurate machine fits and snug bearing capsules practical.

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Heavy cross shafts, supported in antifriction bearings.

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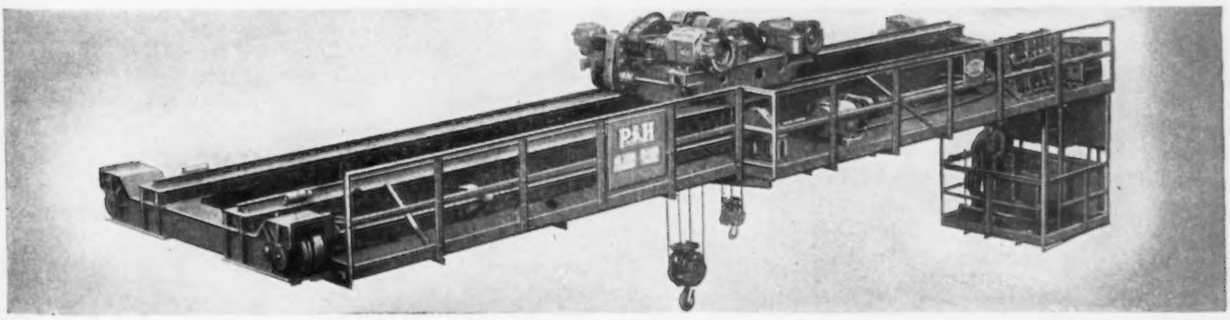

NONFERROUS METALS

. . . News and Market Activities

Tighter Zinc, Aluminum Inventory Limitations

Washington

• • • **Inventory controls** have been tightened by CPA on Special High Grade and Prime Western Grade zinc, die cast alloy, sheet aluminum and convector radiation. Controls were tightened by the June amendment to Priorities Regulation 32, CPA's inventory control regulation. The amendment also made some minor changes for purposes of clarification.

Under the revised regulation Special High Grade zinc and Prime Western zinc and die cast alloy have been placed under a 30 day inventory limitation. The two grades of zinc are in critically short supply and a tendency to accumulate excessive inventories has become evident. The largest user of Special High Grade zinc is the die cast alloy trade and in order to secure proper control of zinc it was necessary to place die cast alloy on the 30 day inventory list as well.

Aluminum sheet, also in short supply, which was formerly exempted from inventory control, is now restricted to a practicable minimum working inventory.

•

Aluminum May Be Released

New York

• • • **It is reported** that CPA has agreed to declare a civilian deficiency in aluminum ingot which would result in the release of stockpile ingot for consumer use.

•

One Copper Strike Over

New York

• • • **The supply of copper** and lead should benefit significantly from the conclusion of the long strike at 16 plants of the American Smelting & Refining Co. which began in February. The agreement is reported to be based on the payment of 18½¢ per hr with retroactive payments of 9¼¢ per hr back to Oct. 1.

However, the Utah mines of Kennecott Copper Co., the largest domestic copper producer, are still closed down, as are the Phelps Dodge workings.

In accordance with the OPA price order, these producers who have not yet been able to work out agreements with the union granting approved wage increases are not yet in a position to charge the new price of 14⅜¢ per lb delivered Connecticut Valley.

•

Chromium Prices Reduced

New York

• • • **New low prices** for electrolytic chromium have been announced here. The price of the ¾-in. size is now $2.00 per lb, compared with $4.00 per lb prior to Jan. 1, 1945, and $2.25 per pound since then. Prices for the ground sizes established Jan. 1, 1945, have also been reduced.

These prices are for the Eastern zone. Corresponding prices are effective for the Central and Western zones.

•

Ferroalloy Prices Rise

New York

• • • **A prominent** ferroalloy producer has announced a price increase of approximately 10 pct in the high carbon ferrochromium and ferrosilicon alloys. The new prices, which appear on the ferroalloys price page of this issue, are effective for contract sales on July 1, 1946, and for spot sales on June 12, 1946. Contract prices on other ferroalloys remain unchanged for the third quarter.

•

Tin Talks Deadlocked

New York

• • • **It is reported here** that the renewal of the agreement with Bolivian tin producers is deadlocked on a price difference of 2¢ between 66¢ asked and 64¢ offered. Moreover, the Bolivians are eager to work out an agreement making the agreed price retroactive to Jan. 1.

The negotiations have been suspended and are not expected to be resumed for several weeks.

OPA Ups Prices On Aluminum Cooking Ware

Washington

• • • **Manufacturers** of aluminum cooking utensils were given a second reconversion price increase by OPA on June 17. The increase was granted to offset wage and materials cost rises that have occurred since the first increase was given last summer.

Prices on sheet aluminum ware were increased between 3¢ and 4¢ on the dollar, and on cast ware a little under 6¢ on the dollar. These increases, plus the adjustments granted last summer, bring manufacturers' ceilings on the two types exactly 14 pct and 9 pct respectively above prices charged in January 1942.

Only a small part of the increase, about 2½ pct, will come through to consumers, however, and that only on the more expensive sheet ware. Consumer ceilings on cast ware remain unchanged.

OPA also announced that manufacturers of bronze and copper insect screen cloth had been authorized to sell these products on an adjustable pricing basis beginning June 14. Sales may be made by producers at current prices subject to payment by buyers of higher prices that may follow an OPA study now under way.

Effective June 18, OPA has granted manufacturers of baking machinery and equipment an interim price increase of 9 pct over their present base date "freeze" levels.

Budd Companies Merge

Philadelphia

• • • **Merger of the** Edward G. Budd Manufacturing Co. and the Budd Wheel Co. into an $80,000,000 corporation to be known as the Budd Co. received approval of stockholders yesterday.

With unfilled orders aggregating $158,000,000, the new concern will operate in four principal divisions, automobile body, railway, wheel and induction heating. Plants are in Philadelphia and Detroit.

Primary Metals

(Cents per lb, unless otherwise noted)

Aluminum, 99+%, f.o.b. shipping point (min. 10,000 lb)	15.00
Aluminum pig, f.o.b. shipping point	14.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb contained Be	$14.75
Beryllium aluminum, 5% Be; dollars per lb contained Be	$30.00
Cadmium, del'd	90.00
Cobalt, 97-99% (per lb)	$1.50 to $1.57
Copper, electro, Conn. Valley	14.375
Copper, electro, New York	14.125
Copper, lake	14.375
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz	$ 2.25
Iridium, dollars per troy oz.	$110.00
Lead, St. Louis	8.10
Lead, New York	8.25
Magnesium, 99.9 + %, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb flask, f.o.b. New York	$101 to $103
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per troy oz.	$56.00
Silver, New York, cents per oz.	70.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.65
Zirconium copper, 6 pct Zr, per lb contained Zr	6.00

Remelted Metals

(Cents per lb)

Aluminum, No. 12 Fdy. (No. 2)	11.00
Aluminum, deoxidizing Nos. 2, 3, 4	9.50 to 11.25
Brass Ingot	
85-5-5-5 (No. 115)	15.50
88-10-2 (No. 215)	18.75
80-10-10 (No. 305)	18.25
No. 1 Yellow (No. 405)	12.50

Copper, Copper Base Alloys

(Mill base, cents per lb)

	Extruded shapes	Rods	Sheets
Copper	25.66	....	25.81
Copper, H.R.	....	22.16	....
Copper drawn	....	23.16	....
Low brass, 80%	....	24.35	24.66
High brass	....	....	24.38
Red brass, 85%	....	24.67	24.98
Naval brass	23.84	22.59	28.53
Brass, free cut	....	18.53	....
Commercial, bronze	....	25.50	25.81
Manganese bronze	27.45	25.95	32.03
Phosphor bronze, A, B, 5%	....	43.68	43.43
Muntz metal	23.59	22.34	26.78
Everdur, Herculoy, Olympic or equal	....	29.82	30.88
Nickel silver, 5%	....	34.44	32.38
Architectural bronze	22.50	....	....

Aluminum

(Cents per lb, base, subject to extras for quantity, gage, size, temper and finish)

Drawn tubing: 2 to 3 in. OD by 0.065 in. wall: 3S, 43.5¢, 52S-O, 67¢ 24S-T, 71¢: base, 30,000 lb.

Plate: ¼ in. and heavier: 2S, 3S, 21.2¢; 52S, 24.2¢; 61S, 23.8¢; 24S, 24S-AL, 24.2¢; 75S, 75S-AL, 30.5¢; base, 30,000 lb and over.

Flat Sheet: 0.136-in. thickness: 2S, 3S, 23.7¢; 52S, 27.2¢; 61S, 24.7¢; 24S-O, 24S-OAL, 26.7¢; 75S-O, 75S-OAL, 32.7¢; base, 30,000 lb and over.

Extruded Solid Shapes: factor determined by dividing the perimeter of the shape by its weight per foot. For factor 1 through 4, 3S, 26¢; 14S, 32.5¢; 24S, 35¢; 53S, 61S, 28¢; 63S, 27¢; 75S, 45.5¢; base, 30,000 lb.

Wire, Rod and Bar: screw machine stock, rounds, 17S-T, ¼ in., 29.5¢; ½ in., 27.5¢; 1 in., 26¢; 2 in., 24.5¢; hexagons, ¼ in., 35.5¢; ½ in., 30¢ 1 in., 2 in., 27¢; base, 5000 lb. *Rod:* 2S, 3S, 1¼ to 2½ in. diam, rolled, 23¢; cold-finished, 23.5¢ base, 30,000 lb. *Round Wire:* drawn, coiled, B & S gage 17-18: 2S, 3S, 33.5¢; 56S, 39.5¢; 10,000 lb base; B & S gage 00-1: 2S, 3S, 21¢; 56S, 30.5¢; B & S 15-16: 2S, 3S, 32.5¢; 56S, 38¢; base, 30,000 lb.

(Continued, See Next Column)

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb or more, 46¢ a lb; 25 to 90 lb, 56¢; less than 25 lb, 66¢.

NONFERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb, f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†	
No. 1 wire, No. 1 heavy copper	11.50
No. 1 tinned copper wire, No. 1 tinned heavy copper	11.50
No. 2 wire, mixed heavy copper	10.50
Copper tuyeres	10.50
Light copper	9.50
Copper borings, No. 1	11.50
No. 2 copper borings	10.50
Lead covered copper wire, cable	.... *
Lead covered telephone, power cable	.... *
Insulated copper	.... *
OPA Group 2†	
Bell metal	17.25
High grade bronze gears	15.00
High grade bronze solids	.... *
Low lead bronze borings	.... *
Babbitt lined brass bushings	14.75
High lead bronze solids	.... *
High lead bronze borings	.... *
Red trolley wheels	12.50
Tinny (phosphor bronze) borings	12.25
Tinny (phosphor bronze) solids	12.25 *
Copper-nickel solids and borings	11.00
Bronze paper mill wire cloth	11.25
Aluminum bronze solids	10.75
Soft red brass (No. 1 composition)	10.75
Soft red brass borings (No. 1)	10.75 *
Gilding metal turnings	10.25
Contaminated gilded metal solids	10.25
Unlined standard red car boxes	10.00
Lined standard red car boxes	9.50
Cocks and faucets	9.50
Mixed brass screens	9.50
Red brass breakage	9.25
Old nickel silver solids	7.60
Old nickel silver borings	7.50
Copper lead solids, borings	6.75
Yellow brass castings	7.50
Automobile radiators	8.75
Zincy bronze solids, borings	9.75
OPA Group 3†	
Fired rifle shells	9.50
Brass pipe	8.75
Old rolled brass	8.25
Admiralty condenser tubes	8.75
Muntz metal condenser tubes	8.25
Plated brass sheet, pipe reflectors	7.75
Manganese bronze solids	8.00[1]
Manganese bronze solids	7.00[2]
Manganese bronze borings	7.25
OPA Group 4†	
Refinery brass	6.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 pct. [2] Lead content 0.41 to 1.00 pct.

Brass Mill Scrap†

Briquetted cartridge brass turnings	10.375
Cartridge brass turnings, loose	9.625
Loose yellow brass trimmings	9.625

Aluminum*

Plant scrap, segregated	
2S solids	8.50 to 9.00
Dural alloys, solids 14, 17, 18, 24S, 25S	5.00 to 5.50
turnings, dry basis	3.50 to 4.00
Low copper, alloys 51, 52, 61, 63S solids	7.00 to 8.00
turnings, dry basis	5.00 to 6.50
Plant scrap, mixed	
Solids	5.25
Turnings, dry basis	4.00
Obsolete scrap	
Pure cable	8.00
Old sheet and utensils	7.50
Old castings and forgings	6.00
Pistons, free of struts	5.00
Pistons, with struts	4.50
Old alloy sheet	3.00 to 4.00

Magnesium*

Segregated plant scrap	
Pure solids and all other solids, exempt	
Borings and turnings	1.50
Mixed, contaminated plant scrap	
Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

*Nominal.

Zinc

New zinc clippings, trimmings	6.50
Engravers, lithographers plates	6.50
Old zinc scrap	4.75
Unsweated zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 1.40¢ a lb from refined metal basing point prices for soft and hard lead including cable, for f.o.b. point of shipment price.

Soft lead scrap	6.50

Nickel

Ni content 98+%, Cu under ½%, 23¢ per lb; 90 to 98% Ni, 23¢ per lb contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb, f.o.b. shipping point in 500 lb lots)

Copper, frt. allowed	
Cast, oval, 15 in. or longer	25⅛
Electrodeposited	18⅞
Rolled, oval, straight	19⅝
Curved	20⅞
Brass, 80-20, frt allowed	
Cast, oval, 15 in. or longer	23⅝
Zinc, cast, 99.99, 15 in. or longer	16¼
Nickel, 99 pct plus, frt allowed	
Cast	47
Rolled, depolarized	48
Silver, 999 fine	
Rolled, 100 oz. lots, per oz.	80¾

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 1-5 bbls	34.00
Copper sulphate, 99.5, crystals, bbls	7.75
Nickel salts, single, 425 lb bbls, frt allowed	13.50
Silver cyanide, 100 oz lots, per oz.	0.655
Sodium cyanide, 96 pct, domestic, 100 lb drums	15.00
Zinc cyanide, 100 lb drums	33.00
Zinc sulphate, 89 pct, crystals, bbls, frt allowed	6.35

SCRAP

. . . News and Market Activities

OPA Rebuff Fails to Affect Market

New York

• • • **No change** in the supply of iron and steel scrap followed OPA's denial last week of the recommendation by the Institute of Scrap Iron & Steel of a $2.50 per ton price increase.

Observers who had claimed many dealers were holding inventories in expectation of a price increase were confounded, for there was no apparent change in the supply. Dealers in St. Louis, however, were so incensed that sources there report scrap is moving only where absolutely necessary. In Pittsburgh, and elsewhere buyers were resorting to various quasi-legal methods of supply.

Brightest hope, but a faint one, is the fact that CPA is studying the problem of returning battlefield scrap.

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PITTSBURGH—Refusal of the OPA to increase prices will have relatively little effect on the movement of scrap. Despite charges of a hold back, no evidence of such practice can be found. Some industry members indicate that MPR-4, which worked with only minor adjustments from April 4, 1941, through four years of war, and nearly a year of postwar, should not be changed basically now during the last months of price control. Dealers are paying over-ceiling on unprepared, mainly with the view that costs can be recovered from salvage and from preparing the material for low phos grades, permitting a slightly better margin on costs. Observers anticipate a heavier movement of industrial scrap within the next ten days as fabricators get under way on their normal production.

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CHICAGO—The OPA announcement that scrap prices will not be raised has had little influence in bringing forth additional material which some thought had been held for higher prices. Both selling and buying contracts, however, carry stipulation that prices in effect at time of shipment will govern, thus guaranteeing against effect of possible fluctuation in event of change of OPA policy. Lack of scrap continues to have an adverse effect upon the operating rate in the district, with all available steel material bringing ceiling prices.

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PHILADELPHIA—Mills here have all reopened production but the supply of scrap is acknowledged to be serious. Some mill officials foresee that the scrap shortage may yet grow worse and would therefore be willing to accept a price increase in order to encourage an improved supply. However the increase of $2.50 per ton was considered to be high. Dealers are reported not to be holding back scrap, but on the other hand they are not forcing production, and are diverting their activities to more lucrative channels.

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DETROIT — New regulations have been adopted by dealers and approved by OPA tightening grade regulations for scrap. There is no evidence of industrial hoarding of scrap. No improvement in the present critical supply situation is looked for until automobile production is maintained at much higher levels than those obtaining at present. Meanwhile, the critical nature of the pig iron shortage here may be judged by the prediction by G. T. Christopher, Packard president, that his company will be forced to close down as a result of the diversion of pig iron to the federal housing program.

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BOSTON—More and more sales of unprepared steel at above ceiling prices by subterfuge of direct-to-mill shipments keep cropping up, purely black market transactions. So-called busheling is fairly active, an indication that more yards are in the second hand end of the game. Legitimately, borings and turnings move well, but below 1943-44 averages, largely to gas purifiers. Heavy steel, cast, low phos and other scraps are inactive. If yards stocked in anticipation of higher prices there is no indication as yet. Brightest current market factor is local Navy yard. It is taking bids until June 26 on 1000 tons of unprepared, 500 tons No. 1 and 400 tons No. 2 steel, and 400 tons light iron.

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NEW YORK—Scrap is moving very slowly from this area with little or no industrial or obsolescence scrap coming out yet because of the production delay caused by the wave of strikes. The action of the OPA Industry Advisory Committee in rejecting the $2.50 price increase agreed on by the Scrap Institute directorate is believed not to have helped toward increasing the collection and preparation of scrap. Mills are frankly recognizing the shortage of this raw material and some officials have signified willingness to absorb the increase in the interest of continuing steel production.

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BUFFALO — Predictions of a scrap famine that will severely curtail steel production next winter greeted OPA's latest rebuff to dealers seeking higher prices. Consumers continued to report little or no headway in accumulating reserves and some are operating on a virtual "car to furnace" basis. While brokers opined the government's decision to hold the line would loosen up material held for a rise, the additional tonnage is expected to be not great and only temporary. Regarding the campaign to increase the flow of scrap from industrial plants the attitude is generally "let's wait and see." About 3000 tons is in the barge canal system enroute from New York City to local mills and two cargoes of 5000 tons each are reported booked for shipment from the lakehead at Buffalo.

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ST. LOUIS—Dealers who have been holding scrap iron in the hope of getting a price increase from the OPA are keenly disappointed at the agency's rejection of the plea, and they are incensed. Until such time as they cool off, it is expected that shipments will be limited to that which may be necessary because of lack of storage facilities or for financial reasons. Because of the long shut down of Granite City Steel Co., other mills in the district are well supplied with material.

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CINCINNATI — The market in this area is facing a definite shortage with shipments now at the lowest level in many years, and demand almost as extensive as during the war. Normal requirements were boosted as a result of the coal and transportation strikes, since melters sought scrap in an effort to continue their operations. As a result, most yards have been stripped of all good material, and with production scrap faltering, dealers and brokers are at wits' end to keep customers supplied. Yard inventories are definitely low.

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CLEVELAND — Demand continues to exceed supply by a wide margin. The consensus is that the shortage does not result in any way from scrap being held back by dealers in hopes of higher prices. The amount of scrap being held for the higher price objective is considered to be negligible. If the shortage continues, at the present level, operations will shortly be based upon scrap inventories rather than orders.

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BIRMINGHAM — Little scrap of any type is being produced in this area and no early improvement in the supply situation is indicated. Agricultural scrap is practically non-existent and industrial scrap is moving in very limited quantities.

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TORONTO—With supply at a critical stage consumers are taking advantage of every opportunity to obtain scrap for current needs. Deliveries from Western Canada are slowing down due to curtailment in transportation facilities which are required for the movement of coal. Offerings from farm communities are also at a minimum and only about 25 pct of normal supply is coming from industrial plants. The Steel Co. of Canada Ltd., Hamilton, has purchased the hulk of the old luxury liner *Hamonic* which is expected to yield some 3000 tons of scrap steel; 29 obsolete U. S. lake freighters and several corvettes. It is estimated that the old ships will provide about 150,000 tons of scrap. Scrap shortage is reflected in curtailed operations among a number of foundries that are unable to obtain cast or stove plate and also report difficulty in obtaining enough pig iron to offset scrap shortage.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages. Where asterisks are used on quotations below, this indicates a ceiling price to which must be added brokerage fee and adjusted freight.

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
RR. hvy. melting	21.00*
No. 2 hvy. melting	20.00*
RR. scrap rails	21.50*
Rails 3 ft. and under	23.50*
No. 1 comp'd sheets	20.00*
Hand bdld. new shts.	20.00*
Hvy. axle turn.	19.50*
Hvy. steel forge turn.	19.50*
Mach. shop turn.	15.00*
Short shov. turn.	17.00*
Mixed bor. and turn.	15.00*
Cast iron borings	16.00*
Hvy. break cast.	16.50*
No. 1 cupola	20.00*
RR. knuck. and coup.	24.50*
RR. coil springs	24.50*
Rail leaf springs	24.50*
Rolled steel wheels	24.50*
Low phos. bil. crops	25.00*
Low phos.	22.50*
RR. malleable	22.00*

CHICAGO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 1 bundles	18.75*
No. 2 dealers' bndls.	18.75*
Bundled mach. shop turn.	18.75*
Galv. bundles	16.75*
Mach. shop turn.	13.75*
Short shovels, turn.	15.75*
Cast iron borings	14.75*
Mix. borings & turn.	13.75*
Low phos. hvy. forge	23.75*
Low phos. plates	21.25*
No. 1 RR. hvy. melt.	19.75*
Reroll rails	22.25*
Miscellaneous rails	20.25*
Angles & splice bars	22.25*
Locomotive tires, cut	24.25*
Cut bolsters & side frames	22.25*
Standard stl. car axles	25.75*
No. 3 steel wheels	23.25*
Couplers & knuckles	23.25*
Agricul. malleable	22.00*
RR. malleable	22.00*
No. 1 mach. cast	20.00*
Rails 3 ft. and under	22.25*
No. 1 agricul. cast	20.00*
Hvy. breakable cast.	16.50*
RR. grate bars	15.25*
Cast iron brake shoes	15.25*
Stove plate	19.00*
Clean auto cast.	20.00*
Cast iron carwheels	20.00*

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
No. 1 bundles	19.50*
No. 2 bundles	19.50*
Mach. shop turn.	$10.50 to 11.00
Shoveling turn.	12.50 to 13.00
Cast iron borings	11.50 to 12.00
Mixed bor. & turn.	11.50 to 12.00
Low phos. plate	22.00*
No. 1 cupola cast.	20.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Scrap rails	21.00*

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$15.05*
No. 2 hvy. melting	15.05*
Nos. 1 and 2 bundles	15.05*
Busheling	15.05*
Turnings, shovelings	12.05*
Machine shop turn.	10.05*
Mixed bor. & turn.	10.05*
Cl'n cast, chem. bor.	$13.06 to 14.15*

Truck delivery to foundry

Machinery cast.	21.00 to 23.51*
Breakable cast.	21.57 to 21.87*
Stove plate	20.00 to 23.51*

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$17.32*
No. 2 hvy. melting	17.32*
No. 1 bundles	17.32*
New busheling	17.32*
Flashings	17.32*
Mach. shop turn.	12.32*
Short shov. turn.	14.32*
Cast iron borings	13.32*
Mixed bor. & turn.	12.32*
Low phos. plate	19.82*
No. 1 cupola cast.	20.00*
Charging box cast.	19.00*
Hvy. breakable cast.	16.50*
Stove plate	19.00*
Automotive cast.	20.00*

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.75*
No. 2 hvy. melting	18.75*
No. 2 bundles	18.75*
Mach. shop turn.	13.75*
Shoveling turn.	15.75*
Cast iron borings	14.75*
Mixed bor. & turn.	13.75*
No. 1 cupola cast.	20.00*
Hvy. breakable cast.	16.50*
Cast, charging box	19.00*
Hvy. axle forge turn.	18.25*
Low phos. plate	21.25*
Low phos. punchings	21.25*
Billet crops	21.25*
RR. steel wheels	23.25*
RR. coil springs	23.25*
RR. malleable	22.00*

ST. LOUIS

Per gross ton delivered to consumer:

Heavy melting	$17.50*
Bundled sheets	17.50*
Mach. shop turn.	12.50*
Locomotive tires, uncut.	$18.50 to 19.00
Misc. std. sec. rails	19.00*
Rerolling rails	21.00*
Steel angle bars	21.00*
Rails 3 ft and under	21.50*
RR. springs	22.00*
Steel car axles	24.50*
Stove plate	19.00*
Grate bars	15.25*
Brake shoes	15.25*
RR. malleable	22.00*
Cast iron carwheels	20.00*
No. 1 mach'ery cast	20.00*
Breakable cast.	16.50*

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00*
No. 2 hvy. melting	17.00*
No. 2 bundles	17.00*
No. 1 busheling	17.00*
Long turnings	12.00*
Shoveling turnings	14.00*
Cast iron borings	13.00*
Bar crops and plate	$18.50 to 19.50*
Structural and plate	18.50 to 19.50*
No. 1 cast	20.00*
Stove plate	19.00*
Steel axles	18.50*
Scrap rails	18.50
Rerolling rails	20.50*
Angles & splice bars	20.50 to 21.00
Rails 3 ft. & under	21.00*
Cast iron carwheels	17.50 to 18.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$20.00*
No. 2 hvy. melting	20.00*
Low phos. plate	22.50*
No. 1 busheling	20.00*
Hydraulic bundles	20.00*
Mach. shop turn.	15.00*
Short shovel. turn.	17.00*
Cast iron borings	16.00*

NEW YORK

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$15.33*
No. 2 hvy. melting	15.33*
Comp. black bundles	15.33*
Comp. galv. bundles	13.33*
Mach. shop turn.	10.33*
Mixed bor. & turn.	10.33*
Shoveling turn.	12.33*
No. 1 cupola cast	20.00*
Hvy. breakable cast	16.50*
Charging box cast	19.00*
Stove plate	19.00*
Clean auto cast	20.00*
Unstrip. motor blks.	17.50*
Cl'n chem. cast bor.	14.33*

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.25*
No. 1 bundles	19.25*
No. 2 bundles	19.25*
No. 2 hvy. melting	19.25*
Mach. shop turn.	14.25*
Shoveling turn.	16.25*
Cast iron borings	14.25*
Cast iron borings	15.25*
Mixed bor. & turn.	14.25*
Stove plate	19.00*
Low phos. plate	21.75*
Scrap rails	20.75*
Rails 3 ft. & under	22.75*
RR. steel wheels	23.75*
Cast iron car wheels	20.00*
RR. coil & leaf spgs.	23.75*
RR. knuckles & coup.	23.75*
RR. malleable	22.00*
No. 1 busheling	19.25*

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50*
No. 2 hvy. melting	19.50*
Compressed sheet stl.	19.50*
Drop forge flashings	19.00
No. 2 bundles	19.50*
Mach. shop turn.	14.50*
Short shovel.	16.50*
No. 1 busheling	19.50*
Steel axle turn.	19.00*
Low phos. billet and bloom crops	24.50*
Cast iron borings	15.50*
Mixed bor. & turn.	14.50*
No. 2 busheling	17.00*
No. 1 machine cast	20.00*
Railroad cast	20.00*
Railroad grate bars	15.25*
Stove plate	19.00*
RR. hvy. melting	20.50*
Rails 3 ft. & under	23.00*
Rails 18 in. & under	24.25*
Rails for rerolling	23.00*
Railroad malleable	22.00*
Elec. furnace punch	22.00*

SAN FRANCISCO

Per gross ton delivered to consumer:

RR. hvy. melting	$18.00*
No. 1 hvy. melting	17.00*
No. 2 hvy. melting	17.00*
No. 2 bales	$15.00 to 15.75
No. 3 bales	8.50 to 9.25
Mach. shop turn.	6.50 to 7.25
Elec. furn. 1 ft. und.	15.50 to 17.00
No. 1 cupola cast	19.00 to 21.00

LOS ANGELES

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.00
No. 2 hvy. melting	17.00
No. 1 bales	$16.00 to 16.75
No. 2 bales	15.00 to 15.75
No. 3 bales	8.00 to 9.00
Mach. shop turn.	7.00
No. 1 cupola cast.	19.00 to 21.00

SEATTLE

Per gross ton delivered to consumer:

RR. hvy. melting	$14.50*
No. 1 & No. 2 hvy. melting	14.50*
Elec. furn. 1 ft. und.	$14.00 to 15.00
No. 1 cupola cast	20.00*

HAMILTON, ONT.

Per gross ton delivered to consumer:

Heavy melting	$17.50*
No. 1 bundles	17.50*
No. 2 bundles	17.00*
Mixed steel scrap	15.50*
Rails, remelting	18.50*
Rails, rerolling	21.50*
Bushelings	13.00*
Mixed borings & turnings	12.50*
Electric furnace bundles	20.50*
Manganese steel scrap	20.00*
No. 1 cast	19.00*
Stove plate	17.50*
Car wheels, cast	19.50*
Malleable iron	16.00*

Comparison of Prices . .

Advances over past week in **Heavy Type**; declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

Flat-Rolled Steel: (cents per pound)	June 18, 1946	June 11, 1946	May 14, 1946	June 19, 1945
Hot-rolled sheets	2.425	2.425	2.425	2.20
Cold-rolled sheets	3.275	3.275	3.275	3.05
Galvanized sheets (24 ga.)	4.05	4.05	4.05	3.70
Hot-rolled strip				
6-in. and under	2.45	2.45	2.45	2.10
Over 6 in.	2.35	2.35	2.35	2.10
Cold-rolled strip	3.05	3.05	3.05	2.80
Plates	2.50	2.50	2.50	2.25
Plates, wrought iron	4.112	4.112	4.112	3.80
Stain's c-r strip (No. 302)	30.30	30.30	30.30	28.00
Tin and Terneplate: (dollars per base box)				
Tinplate, standard cokes	$5.25	$5.25	$5.25	$5.00
Tinplate, electro (0.50 lb)	4.75	4.75	4.75	4.50
Special coated mfg. ternes	4.55	4.55	4.55	4.30
Bars and Shapes: (cents per pound)				
Merchant bars	2.50	2.50	2.50	2.25
Cold-finished bars	3.10	3.10	3.10	2.65
Alloy bars	2.92	2.92	2.92	2.70
Structural shapes	2.35	2.35	2.35	2.10
Stainless bars (No. 302)	25.97	25.97	25.97	24.00
Wrought iron bars	4.76	4.76	4.76	4.40
Wire and Wire Products: (cents per pound)				
Bright wire	3.05	3.05	3.05	2.75
Wire nails	3.75	3.75	3.25	2.90
Rails: (dollars per net ton)				
Heavy rails	$43.39	$43.39	$43.39	$43.00
Light rails	49.18	49.18	49.18	45.00
Semifinished Steel: (dollars per gross ton)				
Rerolling billets	$39.00	$39.00	$39.00	$36.00
Sheet bars	38.00	38.00	38.00	36.00
Slabs, rerolling	39.00	39.00	39.00	36.00
Forging billets	47.00	47.00	47.00	42.00
Alloy blooms, billets, slabs	58.43	58.43	58.43	54.00
Wire Rods and Skelp: (cents per pound)				
Wire rods	2.30	2.30	2.30	2.15
Skelp	2.05	2.05	2.05	1.90

Pig Iron*: (per gross ton)	June 18, 1946	June 11, 1946	May 14, 1946	June 19, 1945
No. 2 foundry, Phila.	$28.34	$28.34	$28.34	$26.84
No. 2, Valley furnace	26.50	26.50	26.50	25.00
No. 2, Southern, Cin'ti	26.94	26.94	26.94	25.44
No. 2, Birmingham	22.88	22.88	22.88	21.38
No. 2 foundry, Chicago†	26.50	26.50	26.50	25.00
Basic, del'd eastern Pa.	27.84	27.84	27.84	26.34
Basic, Valley furnace	26.00	26.00	26.00	24.50
Malleable, Chicago†	26.50	26.50	26.50	25.00
Malleable, Valley	26.50	26.50	26.50	25.00
L. S. charcoal, Chicago	42.34	42.34	42.34	42.34
Ferromanganese‡	135.00	135.00	135.00	135.00

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.
*Subject to retroactive adjustment by OPA.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.25
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.32	17.32	17.32	17.32
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Chicago	20.00	20.00	20.00	20.00
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$7.50	$7.50	$7.50	$7.50
Foundry coke, prompt	9.00	9.00	9.00	9.00
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro., Conn.	14.375	14.375	12.00	12.00
Copper, Lake	14.375	14.375	12.00	12.00
Tin, Straits, New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	8.10	8.10	6.35	6.35
Aluminum, virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943, issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

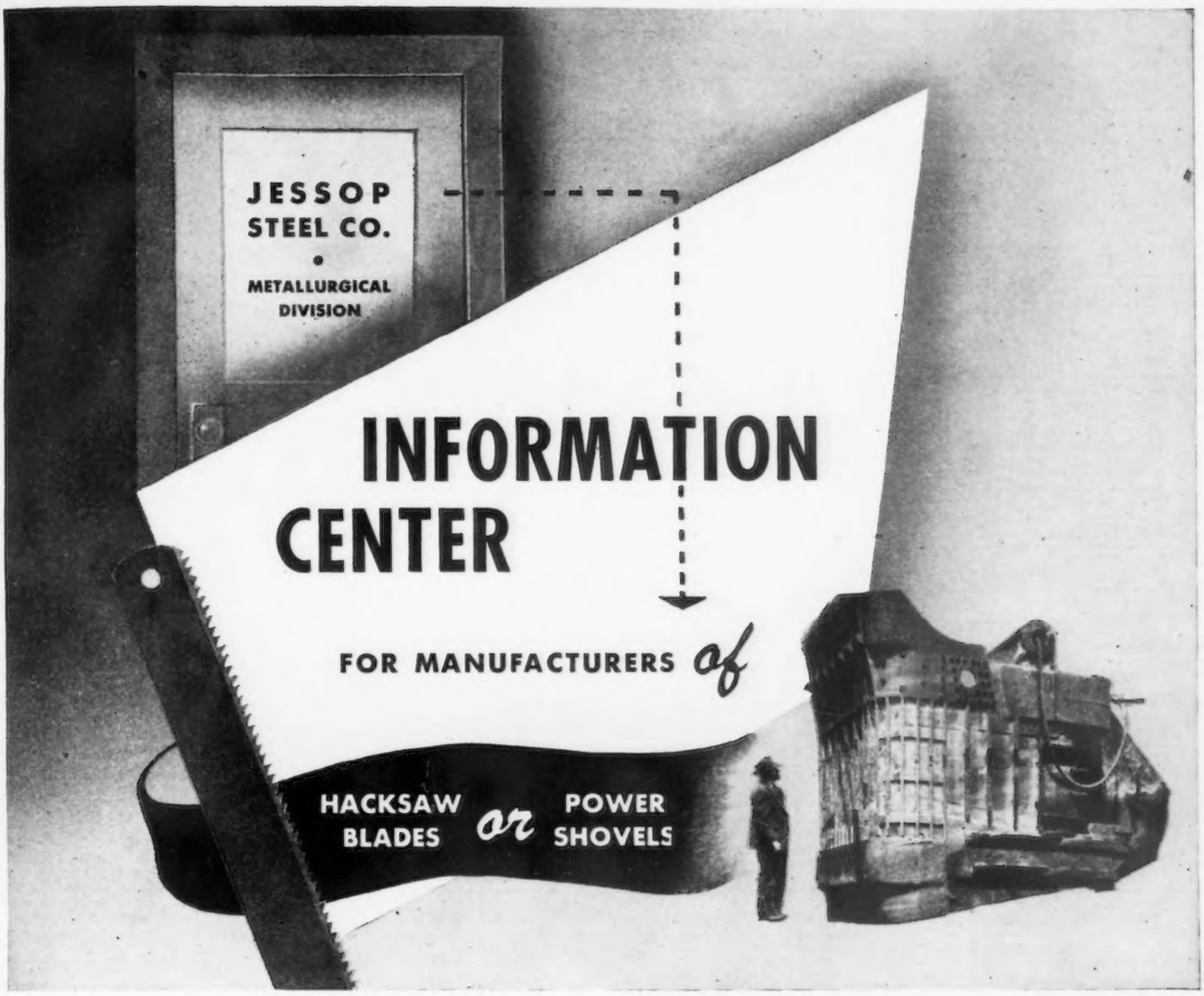
	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 18, 1946	2.72115¢ per lb.	$26.12 per gross ton	$19.17 per gross ton
One week ago	2.72115¢ per lb.	$26.12 per gross ton	$19.17 per gross ton
One month ago	2.72115¢ per lb.	$26.12 per gross ton	$19.17 per gross ton
One year ago	2.42471¢ per lb.	$24.61 per gross ton	$19.00 per gross ton

	HIGH		LOW		HIGH	LOW	HIGH	LOW
1946	2.72115¢ Apr.	2	2.54490¢ Jan.	1	$26.12 Mar. 19	$25.37 Jan. 1	$19.17	$19.17
1945	2.44104¢ Oct.	2	2.38444¢ Jan.	2	25.37 Oct. 23	23.61 Jan. 2	$19.17 Jan. 2	$18.92 May 22
1944	2.30837¢ Sept.	5	2.21189¢ Oct.	5	$23.61	$23.61	19.17 Jan. 11	15.76 Oct. 24
1943	2.29176¢		2.29176¢		23.61	23.61	$19.17	$19.17
1942	2.28249¢		2.28249¢		23.61	23.61	19.17	19.17
1941	2.43078¢		2.43078¢		$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan.	2	2.24107¢ Apr.	16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan.	3	2.26689¢ May	16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan.	4	2.27207¢ Oct.	18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar.	9	2.32263¢ Jan.	4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 9
1936	2.32263¢ Dec.	28	2.05200¢ Mar.	10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 8
1935	2.07642¢ Oct.	1	2.06492¢ Jan.	8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr.	24	1.95757¢ Jan.	2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct.	3	1.75836¢ May	2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July	5	1.83901¢ Mar.	1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan.	13	1.86586¢ Dec.	29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1930	2.25488¢ Jan.	7	1.97319¢ Dec.	9	18.21 Jan. 7	15.90 Dec. 16	15.00 Feb. 18	11.25 Dec. 9
1929	2.31773¢ May	28	2.26498¢ Oct.	29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 3

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo Valley and Birmingham.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.



Composite steel for hacksaw blades, or high tensile steel for 52-ton shovel buckets . . . these are but two in the complete line of JESSOP high grade specialty steels which are found in thousands of applications throughout industry. Among the latest additions to this line are sintered carbide and cast tungsten-chromium-cobalt tools, dies, and wear-resisting parts, as well as cast-to-shape tool steels, stainless steels, and heat resisting steels.

More and more users of alloy steels now depend upon JESSOP to specify the type of steel best suited to their individual requirements. In many instances our modern research laboratories have developed special steels for special applications. Our facilities are at your service.

JESSOP STEEL COMPANY
WASHINGTON, PENNA.
Manufacturers of High Grade Specialty Steels

Iron and Steel Prices...

Steel prices shown here are f.o.b. basing points, in cents per pound or dollars per gross ton. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Mill run sheet, 10¢ per 100 lb under base; primes, 25¢ above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 lb to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6. (14) Billets only. (15) 9/32 in. to 47/64 in., 0.15¢ per lb higher. Alloy price increases are retroactive to Feb. 15.

Basing Points	Pitts-burgh	Chicago	Gary	Cleve-land	Birm-ingham	Buffalo	Youngs-town	Spar-rows Point	Granite City	Middle-town, Ohio	Gulf Ports, Cars	To Pacific Ports, Cars	DELIVERED TO Detroit	New York	Phila-delphia
INGOTS															
Carbon, rerolling	($33.00 f. o. b. mill)														
Carbon, forging	$38	$38	$38	$38	$38	$38	$38								
Alloy	$48.69	$48.69				$48.69	(Bethlehem, Massillon, Canton, Coatesville=$48.69)								
BILLETS, BLOOMS, SLABS						(Provo=$50.20, Duluth=$41[14])									
Carbon, rerolling	$39	$39	$39	$39	$39	$39	$39	$39				$51[14]	$41		
						(Provo=$58.20, Duluth=$49[14])									
Carbon, forging billets	$47	$47	$47	$47	$47	$47	$47					$59[14]	$49		
Alloy	$58.43	$58.43				$58.43	(Bethlehem, Massillon, Canton=$58.43)						$60.59		
SHEET BARS	$38	$38		$38		$38	$38	$38	(Canton=$38)						
PIPE SKELP	2.05¢	2.05¢					2.05¢	2.05¢	(Coatesville=2.05¢)						
WIRE RODS [15]															
No. 5 to 9/32 in.	2.30¢	2.30¢		2.30¢	2.30¢	(Worcester=2.40¢)					2.55¢	2.80¢			
SHEETS															
Hot-rolled	2.425¢	2.425¢	2.425¢	2.425¢	2.425¢	2.425¢	2.425¢	2.425¢	2.525¢	2.425¢		2.975¢	2.525¢	2.665¢	2.595¢
Cold-rolled[1]	3.275¢	3.275¢	3.275¢	3.275¢		3.275¢	3.275¢		3.375¢	3.275¢		3.925¢	3.375¢	3.615¢	3.595¢
Galvanized (24 gage)	4.05¢	4.05¢	4.05¢		4.05¢	4.05¢	4.05¢	4.05¢	4.15¢	4.05¢		4.60¢		4.29¢	4.22¢
Enameling (20 gage)	3.80¢	3.80¢	3.80¢	3.80¢			3.80¢		3.90¢	3.80¢		4.45¢	3.90¢	4.16¢	4.12¢
Long ternes[2]	4.05¢	4.05¢	4.05¢									4.80¢		4.41¢	4.37¢
STRIP															
Hot-rolled[3] 6 in. and under	2.45¢	2.45¢	2.45¢	2.45¢	2.45¢		2.45¢			2.45¢		3.10¢	2.55¢	2.81¢	2.77¢
Hot-rolled[3] over 6 in.	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢		2.35¢			2.35¢		3.00¢	2.45¢	2.71¢	2.67¢
Cold-rolled[4]	3.05¢	3.15¢		3.05¢			3.05¢	(Worcester=3.25¢)					3.15¢	3.41¢	3.37¢
Cooperage stock	2.55¢	2.55¢			2.55¢		2.55¢							2.91¢	
Commodity cold-rolled	3.20¢	3.30¢		3.20¢			3.20¢	(Worcester=3.60¢)					3.30¢	3.56¢	
TINPLATE															
Standard cokes, base box	$5.25	$5.25	$5.25		$5.35			$5.35	$5.35					$5.604[11]	$5.53[11]
Electro, box 0.25 lb	$4.60	$4.60	$4.60					$4.70							
Electro, box 0.50 lb	$4.75	$4.75	$4.75					$4.85	$4.85						
Electro, box 0.75 lb	$4.90		$4.90					$5.00	$5.00						
BLACKPLATE															
29 gage[5]	3.30¢	3.30¢	3.30¢					3.40¢	3.40¢						3.57¢
TERNES, MFG.															
Special coated, base box	$4.55	$4.55	$4.55					$4.65	$4.65						
BARS								(Duluth=2.60¢)							
Carbon steel	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	(Provo, Utah=3.20¢)			2.85¢	3.15¢	2.60¢	2.84¢	2.82¢
Rail steel[6]	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢					2.85¢	3.15¢			
Reinforcing (billet)[7]	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢			2.70¢	2.75¢	2.45¢	2.59¢	2.67¢
Reinforcing (rail)[7]	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢	2.35¢				2.70¢	2.75¢	2.45¢		2.57¢
Cold-finished[8]	3.10¢	3.10¢	3.10¢	3.10¢		3.10¢		(Detroit=3.15¢)			(Toledo=3.25¢)			3.44¢	3.42¢
Alloy, hot-rolled	2.92¢	2.92¢				2.92¢	2.92¢	(Bethlehem, Massillon, Canton=2.92¢)					3.03¢		
Alloy, cold-drawn	3.62¢	3.62¢	3.62¢	3.62¢		3.62¢							3.73¢		
PLATE								(Coatesville and Claymont=2.50¢, Provo, Utah=3.20¢)							
Carbon steel[13]	2.50¢	2.50¢	2.50¢	2.50¢	2.50¢		2.50¢	2.50¢			2.85¢	3.05¢	2.72¢	2.69¢	2.55¢
Floor plates	3.75¢	3.75¢									4.10¢	4.40¢		4.11¢	4.07¢
Alloy	3.79¢	3.79¢			(Coatesville=3.79¢)						4.27¢	4.49¢		4.00¢	3.88¢
SHAPES															
Structural	2.35¢	2.35¢	2.35¢		2.35¢	2.35¢	(Bethlehem=2.35¢)				2.60¢	3.00¢		2.52¢	2.465¢
SPRING STEEL, C-R															
0.26 to 0.50 carbon	2.80¢			2.80¢			(Worcester=3.20¢)								
0.51 to 0.75 carbon	4.30¢			4.30¢			(Worcester=4.50¢)								
0.76 to 1.00 carbon	6.15¢			6.15¢			(Worcester=6.35¢)								
1.01 to 1.25 carbon	8.35¢			8.35¢			(Worcester=8.55¢)								
WIRE [9]															
Bright[12]	3.05¢	3.05¢		3.05¢	3.05¢		(Worcester=3.15¢)		(Duluth=3.10¢)			3.55¢			3.37¢
Galvanized	Add proper size extra and galvanizing extra to Bright Wire Base														
Spring (high carbon)	4.00¢	4.00¢		4.00¢			(Worcester=4.10¢)					4.50¢			4.32¢
PILING															
Steel sheet	2.65¢	2.65¢				2.65¢						3.20¢			2.97¢

CORROSION AND HEAT RESISTANT STEELS

In cents per pound, f.o.b. basing point

BASING POINT	Chromium Nickel		Straight Chromium			
	No. 304	No. 302	No. 410	No. 430	No. 442	No. 446
Ingot, P'gh, Chi, Canton, Balt, Reading, Ft. Wayne, Phila.	Subject to negotiation			Subject to negotiation		
Blooms, P'gh, Chi, Canton, Phila, Reading, Ft. Wayne, Balt.	22.99	24.67	17.01	17.47	20.69	25.29
Slabs, P'gh, Chi, Canton, Balt, Phila, Reading	22.99	24.67	17.01	17.47	20.69	25.29
Billets P'gh, Chi, Canton, Newark, N. J., Watervliet, Syracuse, Balt.	Subject to negotiation			Subject to negotiation		
Billets, forging, P'gh, Chi, Canton, Dunkirk, Balt, Phila, Reading, Watervliet, Syracuse, Newark, N. J., Ft. Wayne, Titusville	22.99	24.67	17.01	17.47	20.69	25.29
Bars, h-r, P'gh, Chi, Canton, Dunkirk, Watervliet, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne, Titusville	27.05	25.97	20.02	20.56	24.34	29.75
Bars, c-f, P'gh, Chi, Cleve, Canton, Dunkirk, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne, Watervliet	27.05	25.97	20.02	20.56	24.34	29.75
Plates, P'gh, Middletown, Canton	31.38	29.21	23.28	23.80	28.67	33.00
Shapes, structural, P'gh, Chi	27.05	25.97	20.02	20.56	24.34	29.75
Sheets, P'gh, Chi, Middletown, Canton, Balt.	38.95	36.79	28.67	31.38	35.16	38.49
Strip, h-r, P'gh, Chi, Reading, Canton, Youngstown	25.43	23.28	18.39	18.93	25.97	37.87
Strip, c-r, P'gh, Cleve, Newark, N. J., Reading, Canton, Youngstown	32.46	30.30	23.80	24.34	34.62	56.26
Wire, c-d, Cleve, Dunkirk, Syracuse, Balt, Reading, Canton, P'gh, Newark, N. J., Phila.	27.05	25.97	20.02	20.56	24.34	29.75
Wire, flat, c-r, Cleve, Balt, Reading, Dunkirk, Canton	32.46	30.30	23.80	24.34	34.62	56.26
Rod, h-r, Newark, N. J., Syracuse	27.05	25.97	20.02	20.56	24.34	29.75
Tubing, seamless, P'gh, Chi, Canton, (4 in. to 6 in.)	72.09	72.09	.....	68.49	.....	.....

SHELL STEEL

	per gross ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic openhearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

ELECTRICAL SHEETS

Base, all grades f.o.b. Pittsburgh

	per lb
Field grade	3.90¢
Armature	4.25¢
Electrical	4.75¢
Motor	5.425¢
Dynamo	6.125¢
Transformer 72	6.625¢
Transformer 65	7.625¢
Transformer 58	8.125¢
Transformer 52	8.925¢

F.o.b. Chicago and Gary, field grade through motor; f.o.b. Granite City, add 10¢ per 100 lb on field grade to and including dynamo. Pacific ports add 75¢ per 100 lb on all grades.

RAILS, TRACK SUPPLIES

(F.o.b. mill)

Standard rails, heavier than 60 lb	
No. 1 O.H., net ton	$43.39
Angle splice bars, 100 lb	2.85
(F.o.b. basing points)	*per net ton*
Light rails (from billets)	$49.18
Light rails (from rail steel)	49.18
	base per lb
Cut spikes	3.65¢
Screw spikes	5.55¢
Tie plate, steel	2.55¢
Tie plates, Pacific Coast	2.70¢
Track bolts	*4.75¢
Track bolts, heat treated, to railroads	*5.00¢
Track bolts, jobbers discount	63-5

*Plus an increase of 7 pct.

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25¢.

TOOL STEEL

*(F.o.b. Pittsburgh, Bethlehem, Syracuse, Dunkirk. *Also Canton, O.)*

An increase of 8.2 pct applies to base price and extras

	Base per lb
High speed	67¢
Straight molybdenum	54¢
Tungsten-molybdenum	57½¢
High-carbon-chromium*	43¢
Oil hardening*	24¢
Special carbon*	22¢
Extra carbon*	18¢
Regular carbon*	14¢

Warehouse prices on and east of Mississippi are 2¢ per lb higher; west of Mississippi 3¢ higher.

CLAD STEEL

Base prices, cents per pound

	Plate	*Sheet*
Stainless-clad		
No. 304, 20 pct, f.o.b. Pittsburgh, Washington, Pa.	21.00*	22.00
Nickel-clad		
10 pct, f.o.b. Coatesville, Pa.	18.72	....
Inconel-clad		
10 pct, f.o.b. Coatesville	26.00	....
Monel-clad		
10 pct, f.o.b. Coatesville	24.96	....
Aluminized steel		
Hot dip, 20 gage, f.o.b. Pittsburgh	....	9.00

*Includes annealing and pickling.

WIRE PRODUCTS

To the dealer, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	base per keg	
Standard wire nails	$3.75	$4.25
Coated nails	3.75	4.25
Cut nails, carloads	4.85	....
	base per 100 lb	
Annealed fence wire	$3.50	$4.00
Annealed galv. fence wire	3.85	4.35
	base column	
Woven wire fence*	72	90
Fence posts, carloads	74	91
Single loop bale ties††	72	97
Galvanized barbed wire**	79	89
Twisted barbless wire	79	89

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

††Add 50c a ton.

ROOFING TERNEPLATE

(F.o.b. Pittsburgh, 112 sheets)

	20x14 in.	20x28 in.
8-lb coating I.C.	$8.50	$17.00
15-lb coating I.C.	9.50	19.00
20-lb coating I.C.	10.00	20.00

ALLOY EXTRAS

Alloy Steel	Basic Openhearth		Electric Furnace	
	Bars and Bar-strip	Billets, Blooms and Slabs	Bars and Bar-strip	Billets, Blooms and Slabs
A 8600	0.676¢	$13.52	1.196¢	$23.92
A 8700	0.728	14.56	1.248	24.96
NE 9400	0.780	15.60	1.300	26.00
NE 9700	0.676	13.52	1.196	23.92
NE 9800	1.352	27.04	1.872	37.44
NE 9900	1.248	24.96	1.612	32.24

The extras shown are in addition to the base price of $2.92 per 100 lb on finished products and $58.43 per gross ton on semifinished steel, major basing points, as shown in table, opposite page, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. When acid openhearth is specified and acceptable, add to basic openhearth alloy differential 0.27¢ per lb for bars and bar-strip and $5.14 per gross ton for billets, blooms and slabs. Alloy price increases are retroactive to Mar. 1.

WELDED PIPE AND TUBING

Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills

(F.o.b. Pittsburgh only on wrought pipe) base price—$200.00 per net ton

Steel (buttweld)

	Black	Galv.
½-in.	60½	48
¾-in.	63½	52
1-in. to 3-in.	65½	54½

Wrought Iron (buttweld)

½-in.	17⅞	+4⅜
¾-in.	24¼	2⅝
1-in. and 1¼-in.	28⅝	9⅛
1½-in.	33	11⅞
2-in.	32⅜	11¾

Steel (lapweld)

2-in.	58	46½
2½-in. and 3-in.	61	49½
3½-in. to 6-in.	63	51½

Wrought Iron (lapweld)

2-in.	24⅞	4⅞
2½-in. to 3½-in.	25⅞	7½
4-in.	28⅛	11⅝
4½-in. to 8-in.	27	10¼

Steel (butt, extra strong, plain ends)

⅛-in.	58½	47½
¼-in.	62½	51½
1-in. to 3-in.	64	54

Wrought Iron (same as above)

⅛-in.	18⅞	+1⅝
¼-in.	25⅜	4¾
1-in. to 2-in.	33	13

Steel (lap, extra strong, plain ends)

2-in.	56	45½
2½-in. and 3-in.	60	49½
3½-in. to 6-in.	63½	53

Wrought Iron (same as above)

2-in.	28⅛	8⅝
2½-in. to 4-in.	34	16¼
4½-in. to 6-in.	32⅜	14⅝

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On l.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

BOILER TUBES

Seamless steel and lapweld commercial boiler tubes and locomotive tubes, minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots

	Seamless Cold-Drawn	Hot-Rolled	Lap-weld, Hot-Rolled
2 in. O.D. 13 B.W.G.	16.52	13.90	13.20
2½ in. O.D. 12 B.W.G.	22.21	18.70	17.67
3 in. O.D. 12 B.W.G.	24.71	20.79	19.56
3½ in. O.D. 11 B.W.G.	31.18	26.25	24.68
4 in. O.D. 10 B.W.G.	38.68	32.56	30.55

(Extras for less carload quantities)

40,000 lb or ft and over	Base
30,000 lb or ft to 39,999 lb or ft	5 pct
20,000 lb or ft to 29,999 lb or ft	10 pct
10,000 lb or ft to 19,999 lb or ft	20 pct
5,000 lb or ft to 9,999 lb or ft	30 pct
2,000 lb or ft or 4,999 lb or ft	45 pct
Under 2,000 lb or ft	65 pct

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago...$60.80
6-in. and larger, del'd New York... 60.20
6-in. and larger, Birmingham..... 52.00
6-in. and larger, f.o.b. cars, San Francisco, Los Angeles or Seattle 74.00

For all rail shipment; rail and water shipment less.

Class "A" and gas pipe, $3 extra; 4-in. pipe is $5 a ton above 6-in.

BOLTS, NUTS, RIVETS, SET SCREWS

An increase of 7 pct applies to all listings.

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts

Base discount less case lots

Percent Off List

½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

Semifin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
⅝ in. through 1 in.	..	60
9/16 in. through 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 pct additional discount.

Stove Bolts

Consumer

Packages, nuts loose	71 and 10
In packages	71
In bulk	80

On stove bolts freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago, New York on lots of 200 lb or over.

Large Rivets
(½ in. and larger)

Base per 100 Lb

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham $3.75

Small Rivets
(7/16 *in. and smaller*)

Percent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham ..... 65 and 5

Cap and Set Screws

Percent Off List Consumer

Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago or New York on lots of 200 lb or over.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Div. certifies in writing the consumers need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	Base price per short ton
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports)*

Per Gross Ton

Old range, bessemer, 51.50	$4.95
Old range, non-bessemer, 51.50	4.80
Mesaba, bessemer, 51.50	4.70
Mesaba, non-bessemer, 51.50	4.55
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, cents per lb, ton lots.

Brass, minus 100 mesh	18.5¢ to 20.25¢
Copper, electrolytic, 150 and 200 mesh	21½¢ to 23½¢
Copper, reduced, 150 and 200 mesh	20½¢ to 25½¢
Iron, commercial, 100, 200, 325, mesh 96 + % Fe	11¢ to 16¢
Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots	4¢
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63¢
Iron, electrolytic, unannealed, 325 mesh and coarser, 99 + % Fe	27¢ to 42¢
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	31¢
Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90¢
Aluminum, 100 and 200 mesh	*25¢
Antimony, 100 mesh	30¢
Cadmium, 100 mesh	$1.40
Chromium, 100 mesh and finer	$1.25
Lead, 100, 200 & 300 mesh	11½ to 15¢
Manganese, minus 325 mesh and coarser	44¢ to 61¢
Nickel, 150 mesh	51½¢
Silicon, minus 325 mesh and coarser	26¢ to 55¢
Solder powder, 100 mesh	8½¢ plus metal
Tin, 100 mesh	58¾¢
Tungsten metal powder, 98%-99%, any quantity, per lb	$2.60
Molybdenum powder, 99%, in 200-lb kegs, f.o.b. York, Pa., per lb	$2.60
Under 100 lb	$3.00

*Freight allowed east of Mississippi

COKE

Subject to OPA retroactive adjustment.

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.50*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	9.00
Foundry, Byproduct	
Chicago, del'd	13.75
Chicago, f.o.b.	13.00
New England, deld	14.65
Kearny, N. J., f.o.b.	13.05
Philadelphia, del'd	13.28
Buffalo, del'd	13.40
Portsmouth, Ohio, f.o.b.	11.50
Painesville, Ohio, f.o.b.	12.15
Erie, del'd	13.15
Cleveland, del'd	13.20
Cincinnati, del'd	13.25
St. Louis, del'd	13.75†
Birmingham, del'd	10.90

*Hand drawn ovens using trucked coal permitted to charge $8.60 per ton plus transportation charges.

†Except producers situated in states other than Missouri, Alabama or Tennessee, sellers may charge a maximum delivered price of $14.25 in the St. Louis Mo., and East St. Louis, Ill., switching districts.

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

Per 1000

Super-duty brick, St. Louis	$76.05
First quality, Pa., Md., Ky., Mo., Ill., Ohio	60.40
First quality, New Jersey	65.90
Sec. quality, Pa., Md., Ky., Mo., Ill.	54.80
Sec. quality, New Jersey	57.70
Sec. quality, Ohio	52.95
Ground fire clay, net ton, bulk	8.95

Silica Brick*

Pennsylvania and Birmingham	$60.40
Chicago District	69.30
Silica cement, net ton (Eastern)	10.60

Chrome Brick *Per Net Ton*

Standard chemically bonded, Balt., Plymouth Meeting, Chester $54.00

Magnesite Brick

Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. in bulk	22.00
in sacks	26.00

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP			Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
				Hot-Rolled										
	Hot-Rolled (10 gage)	Cold-Rolled	Galvanized (24 gage)	6 in. and Under	Over 6 in.	Cold-Rolled			Hot-Rolled	Cold-Finished	Hot-Rolled, NE 8617-20	Hot-Rolled, NE 8742-50 Ann.	Cold-Drawn, NE 8617-20	Cold-Drawn, NE 8742-50 Ann.
**Philadelphia	$3.743	$5.097	$5.218a	$4.272	$4.172	$5.022	$3.855	$3.916	$4.072	$4.522	$6.016	$7.218	$7.372	$8.522
New York	3.815	4.838[3]	5.46	4.324	4.224	5.024	4.018	4.008	4.103	4.553	6.058	7.158	7.403	8.453
Boston	3.999	4.969[9]	5.674	4.456	4.356	4.965	4.162	4.162	4.294	4.594	6.212	7.312	7.444	8.494
Baltimore	3.619	5.077	5.344	4.252	4.152	....	3.844	4.009	4.052	4.502	....	....	....	....
Norfolk	3.996	....	5.821	4.515	4.415	....	4.221	4.252	4.315	4.615	....	....	....	....
Chicago	3.475	4.425	5.581	3.95	3.85	4.90[17]	3.80	3.80	3.75	4.20	....	....	....	....
Milwaukee	3.612	4.562[3]	5.537	4.087	4.077	5.037[17]	3.937	3.937	3.887	4.337	6.037	7.037	7.187	8.237
Cleveland	3.575	4.625	5.327	3.95	3.85	4.70[17]	3.65	3.838	3.60	4.20	6.006	....	6.95	....
Buffalo	3.575	4.625	5.104/5.20	4.169	4.069	4.919	3.88	3.65	3.60	4.20	5.80	6.90	7.95	8.00
Detroit	3.675	4.725	5.45	4.05	3.95	....	3.859	3.911	3.70	4.25	6.13	....	7.259	....
Cincinnati	3.65	4.70[3]	5.275	4.025	3.925	4.961	3.911	3.941	3.861	4.461	6.15	....	7.311	....
St. Louis	3.622	4.572[3]	5.581	4.097	3.997	5.181[17]	3.947	3.947	3.897	4.481	6.181	....	7.331	....
Pittsburgh	3.575	4.625	5.20	3.95	3.85	4.70	3.65	3.65	3.60	4.20	5.80	6.90	6.95	7.95
St. Paul	3.797	4.747	5.835	4.272	4.172	5.352	4.122	4.122	4.072	4.811	....	....	....	....
Omaha	4.018	5.668	5.965	4.343	4.243	....	4.343	....	4.293	4.893	....	....	....	....
Indianapolis	3.745	4.795	5.37	4.12	4.02	4.99	3.88	3.88	3.83	4.43	6.13	....	7.28	....
Birmingham	3.675	....	5.20	....	....	....	3.80	3.80	3.75	4.903	....	....	....	....
Memphis	4.19	4.885	5.715	4.565	4.465	....	4.315	4.315	4.265	4.78	....	....	....	....
New Orleans	4.283*	5.304	5.808	4.658	4.558	....	4.408	4.408*	4.358*	5.079	....	....	....	....
Houston	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Los Angeles	4.70/5.00	6.80/7.20[3]	6.55	4.95	4.85	....	4.60/4.95	4.45/4.65	4.40/4.55	5.883/6.03	....	....	....	....
San Francisco	4.12	6.87	6.35	4.60	4.50	4.15	4.15	....	4.30	5.78	....	....	....	....
Seattle	4.87[12]	7.27[4]	6.40	4.60	4.50	....	5.00[12]	4.70[12]	4.60[12]	6.23	....	....	....	....
Portland	4.87[11]	6.82[4]	6.20	5.10	5.00	....	5.00[11]	4.70[11]	4.70[11]	5.98	8.15	....	9.20	....
Salt Lake City	4.75	....	6.62[18]	5.88	5.78	....	5.23[18]	5.23[18]	5.13	6.35	....	....	....	....

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT-ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD-ROLLED: Sheets, 400 to 1499 lb; strip, extras on all quantities; bars, 1500 lb base.

NE ALLOY BARS: 1000 to 39,999 lb.

GALVANIZED SHEETS: 450 to 1499 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb and over. (15) 1000 lb and over. (16) 1500 lb and over. (17) 2000 lb and over. (18) 3500 lb and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

* Add 0.271¢ for sizes not rolled in Birmingham.

** City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

PIG IRON PRICES

Maximum per gross ton, subject to retroactive adjustment. Prices do not reflect 3 pct tax on freight.

BASING POINT PRICES

Basing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	27.00	27.50	28.00	28.50	....
Birdsboro	27.00	27.50	28.00	28.50	32.00
Birmingham	21.50	22.88	....	27.50	....
Buffalo	25.50	26.50	27.00	27.50	32.00
Chicago	26.00	26.50	26.50	27.00	....
Cleveland	26.00	26.50	26.50	27.00	....
Detroit	26.00	26.50	26.50	27.00	....
Duluth	26.50	27.00	27.00	27.50	....
Erie	26.00	26.50	27.00	27.50	....
Everett	27.00	27.50	28.00	28.50	....
Granite City	26.00	26.50	26.50	27.00	....
Hamilton	26.00	26.50	26.50	....	....
Neville Island	26.00	26.50	26.50	27.00	....
Provo	24.00	24.50	....	....	....
Sharpsville[1]	26.00	26.00	26.50	27.00	....
Sparrows Point	27.00	27.50	....	....	....
Steelton	27.00	....	....	....	32.00
Swedeland	27.00	27.50	28.00	28.50	....
Toledo	26.00	26.50	26.50	27.00	....
Youngstown	26.00	26.50	26.50	27.00	....

DELIVERED PRICES (BASE GRADES)

Consuming Point	Basing Point	Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	0.50	27.50	28.00	28.50	29.00	....
Boston	Birdsboro-Steelton	4.02	....	....	....	....	38.02
Brooklyn	Bethlehem	2.50	29.50	30.00	30.50	31.00	....
Brooklyn	Birdsboro	2.92	....	....	....	....	34.92
Canton	Clev, Ygstn, Sharpsvil.	1.39	27.39	27.89	27.89	28.39	....
Canton	Buffalo	3.19	....	....	....	....	35.10
Cincinnati	Birmingham	4.06	25.56	26.94	....	....	....
Cincinnati	Hamilton	1.11	....	....	27.61	....	36.40
Cincinnati	Buffalo	4.40	....	....	....	....	....
Jersey City	Bethlehem	1.53	28.53	29.03	29.53	30.03	....
Jersey City	Birdsboro	1.94	....	....	....	....	33.94
Los Angeles	Provo	4.95	28.95	29.45	....	....	....
Los Angeles	Buffalo	15.41	....	....	....	....	47.41
Mansfield	Cleveland-Toledo	1.94	27.94	28.44	28.44	28.94	....
Mansfield	Buffalo	3.36	....	....	....	....	35.38
Philadelphia	Swedeland	0.84	27.84	28.34	28.84	29.34	....
Philadelphia	Birdsboro	1.24	....	....	....	....	33.24
San Francisco	Provo	4.95	28.95	29.45	....	....	....
San Francisco	Buffalo	15.41	....	....	....	....	47.41
Seattle	Provo	4.95	28.95	29.45	....	....	....
Seattle	Buffalo	15.41	....	....	....	....	47.41
St. Louis	Granite City	0.50	26.50	27.00	27.00	27.50	....
St. Louis	Buffalo	7.07	....	....	....	....	39.0

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50¢ per ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10. Apr. 11, 1945, retroactive to Mar. 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50¢ per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct); phosphorus differentials, a reduction of 38¢ per ton for phosphorous content of 0.70 pct and over; manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. Effective Mar. 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 pct silicon covered by RPS 10 as amended. Silvery iron, silicon 6.00 to 6.50 pct, C/L per g.t., f.o.b. Jackson, Ohio—$32.00; f.o.b. Buffalo—$33.25. Add $1.00 per ton for each additional 0.50 pct Si. Add 50¢ per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for prices of comparable analysis.

Ferromanganese

78-82% Mn, maximum contract base price, gross ton, lump size, f.o.b. Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk) $135.00
Less ton lots (packed)..... 148.50
F.o.b. Pittsburgh 139.50

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Briquets—cents per pound of briquet, freight allowed, 66% contained Mn.

	Eastern	Central	Western
Carload, bulk ..	6.05	6.30	6.60
Ton lots	6.65	7.55	8.55
Less ton lots ...	6.80	7.80	8.80

Spiegeleisen

Contract prices, gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50
F.o.b. Pittsburgh, Chicago	40.00	

Manganese Metal

Contract basis, lump size, cents per pound of metal, f.o.b. shipping point, freight allowed.

96-98% Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk 30
L.c.l. lots 32

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads 32
Ton lots 34
Less ton lots 36

Low-Carbon Ferromanganese

Contract price, cents per pound Mn contained, lump size, f.o.b. shipping point, freight allowed, eastern zone.

	Carloads	Ton	Less
0.10 max. C, 0.06% P, 90% Mn	21.00	21.40	21.65
0.10% max. C	20.50	20.90	21.15
0.15% max. C	20.00	20.40	20.65
0.30% max. C	19.50	19.90	20.15
0.50% max. C	19.00	19.40	19.65
0.75% max. C, 7.00% max. Si.....	16.00	16.40	16.65

Silicomanganese

Contract basis, lump size, cents per pound of metal, f.o.b. shipping point, freight allowed. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk 6.05
Ton lots 6.70
Briquet, contract basis, carlots, bulk freight allowed, per lb of briquet. 5.80
Ton lots 6.30
Less ton lots 6.55

Silvery Iron (electric furnace)

Si 14.01 to 14.50%, $51.25 f.o.b. Keokuk, Iowa; $48.00 f.o.b. Jackson, Ohio; $49.25 f.o.b. Niagara Falls. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

Silicon Metal

Contract price, cents per pound contained Si, lump size, f.o.b. shipping point, freight allowed, for ton lots, packed.

	Eastern	Central	Western
96% Si, 2% Fe..	13.10	13.55	16.50
97% Si, 1% Fe..	13.45	13.90	16.80

Ferrosilicon Briquets

Contract price, cents per pound of briquet, bulk, f.o.b. shipping point, freight allowed to destination, 40% Si.

	Eastern	Central	Western
Carload, bulk ..	3.60	3.75	3.90
Ton lots	4.05	4.55	4.60
Less ton lots...	4.45	4.80	4.85

Electric Ferrosilicon

Contract price, cents per pound contained Si, lump size in carloads, f.o.b. shipping point, freight allowed.

	Eastern	Central	Western
50% Si	7.05	7.50	7.65
75% Si	8.55	8.70	9.25
80-90% Si	9.50	9.65	10.15
90-95% Si 11.80		11.95	12.40

Ferrochrome (65-72% *Cr, 2% max. Si*)

Contract prices, cents per pound, contained Cr, lump size in carloads, f.o.b. shipping point, freight allowed.

	Eastern	Central	Western
0.06% C	23.00	23.40	24.00
0.10% C	22.50	22.90	23.50
0.15% C	22.00	22.40	23.00
0.20% C	21.50	21.90	22.50
0.50% C	21.00	21.40	22.00
1.00% C	20.50	20.90	21.50
2.00% C	19.50	19.90	20.50
66-71% Cr, 4-10% C ...	14.50	14.90	15.00
62-66% Cr, 5-7% C	15.05	15.45	15.55

Briquets — contract price, cents per pound of briquet, f.o.b. shipping point, freight allowed, 60% chromium.

	Eastern	Central	Western
Carload, bulk ..	9.20	9.50	9.90
Ton lots	9.80	10.30	11.80
Less ton lots ..10.10		10.60	12.10

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 2¢ per lb to regular low-carbon ferrochrome price schedule. Add 2¢ for each additional 0.25% N. High-carbon type: 66.71% Cr, 4-5% C, 0.75% N. Add 5¢ per lb to regular high-carbon ferrochrome price schedule.

S. M. Ferrochrome

Contract price, cents per pound chromium contained, lump size, f.o.b. shipping point, freight allowed.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

	Eastern	Central	Western
Carload	15.60	16.00	16.10
Ton lots	16.65	17.30	18.50
Less ton lots.	17.30	17.95	19.15

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

	Eastern	Central	Western
Carload	20.00	20.40	21.00
Ton lots	21.00	21.65	22.85
Less ton lots ..	22.00	22.65	23.85

Chromium Metal

Contract prices, cents per lb, chromium contained, carload, f.o.b. shipping point, freight allowed. 97% min. Cr, 1% max. Fe.

	Eastern	Central	Western
0.20% max. C..	83.50	85.00	86.25
0.50% max. C..	79.50	81.00	82.25
9.00% min. C ..	79.50	81.00	82.25

Chromium—Copper

Contract price, cents per pound of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si.

Shot or ingot ..... 45¢

Calcium—Silicon

Contract price per lb of alloy, lump, f.o.b. shipping point, freight allowed.

30-35% Ca, 60-65% Si, 3.00% max. Fe or 28-32% Ca, 60-65% Si, 6.00% max. Fe.

	Eastern	Central	Western
Carloads	13.00	13.50	15.55
Ton lots	14.50	15.25	17.40
Less ton lots...	15.50	16.25	18.40

Calcium—Manganese—Silicon

Contract prices, cents per lb of alloy, lump, f.o.b. shipping point, freight allowed.

16-20% Ca, 14-18% Mn, 53-59% Si.

	Eastern	Central	Western
Carloads	15.50	16.00	18.05
Ton lots	16.50	17.35	19.10
Less ton lots.	17.00	17.85	19.60

Calcium Metal

Eastern zone contract prices, cents per pound of metal, f.o.b. shipping point, freight allowed. Add 1¢ for central zone; 5¢ for western zone.

	Cast	Turnings	Distilled
Ton lots	$1.35	$1.75	$4.25
Less ton lots..	1.60	2.00	5.00

CMSZ

Contract price, cents per pound of alloy, f.o.b. shipping point, freight allowed.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

	Eastern	Central	Western
Ton lots	12.00	12.75	14.75
Less ton lots.	12.50	13.25	15.25

Alloy 5: 50-56% Cr, 4-6% Mn, 13-50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

Ton lots	11.75	12.50	14.50
Less ton lots.	12.25	13.00	15.00

SMZ

Contract price, cents per pound of alloy, f.o.b. shipping point, freight allowed. 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe.

	Eastern	Central	Western
Ton lots	12.00	12.85	14.60
Less ton lots.	12.50	13.35	15.10

Other Ferroalloys

Ferrotungsten, standard, lump or ¼X down, packed, f.o.b. plant Niagara Falls, Washington, Pa., York, Pa., per pound contained T, 5 ton lots, freight allowed.. $1.88

Ferrovanadium, 35-55%, contract basis, f.o.b. plant, freight allowances, per pound contained V.

Openhearth	$2.70
Crucible	$2.80
High speed steel (Primos) ..	$2.90

Vanadium pentoxide, 88-92% V_2O_5 technical grade, contract basis, per pound contained V_2O_5 $1.10

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant, freight allowed, per pound contained Cb.

Ton lots	$2.25
Less ton lots	$2.30

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo ..... 95¢

Calcium molybdate, 40-45%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo ..... 80¢

Molybdenum oxide briquets, 48-52% Mo, f.o.b. Langeloth, Pa., per pound contained Mo ..... 80¢

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per pound contained Mo ..... 80¢

Ferrotitanium, 40-45%, 0.10%C max., f.o.b. Niagara Falls, N. Y., ton lots, per pound contained Ti $1.23
Less ton lots $1.25

Ferrotitanium, 20-25%, 0.10%C max., ton lots, per pound contained Ti $1.35
Less ton lots $1.40

High-carbon ferrotitanium, 15-20%, 6-8% C, contract basis, f.o.b. Niagara Falls, freight allowed, carloads $142.50

Ferrophosphorus, 18%, electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, Electrolytic, 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy.

Carload, lots ..... 14¢

Zirconium, 12-15%, contract basis, lump, f.o.b. plant, freight allowed, per pound of alloy

Carload, bulk ..... 4.60¢

Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Niagara Falls, carload ..... 5.75¢
Ton lots ..... 7.25¢

Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound

Car lots	8.00¢
Ton lots	8.75¢
Less ton lots	9.25¢

Boron Agents

Contract prices per pound of alloy, f.o.b. shipping point, freight allowed. Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

	Eastern	Central	Western
Less ton lots..	$1.30	$1.3075	$1.329

Manganese—Boron **75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.**

Ton lots	$1.89	$1.903	$1.935
Less ton lots...	2.01	2.023	2.055

Nickel—Boron **15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.**

Less ton lots	$2.10	$2.1125	$2.1445

Silcaz No. 3, contract basis, f.o.b. plant, freight allowed, per pound of alloy.

Carload lots	25¢
Ton lots	26¢

Silvaz No. 3, contract basis, f.o.b. plant, freight allowed, per pound of alloy.

Carload lots	58¢
Ton lots	59¢

Grainal, f.o.b. Bridgeville, Pa., freight allowed, 50 lb and over.

No. 1	87.5¢
No. 6	60¢
No. 79	45¢

Bortram, f.o.b. Niagara Falls

Ton lots, per pound	45¢
Less ton lots, per pound.....	50¢

U. S. Petroleum Industry Expected to Increase Use of Diesel Engines

Milwaukee

• • • **The 20-fold** expansion of the diesel engine industry during World War II is only a start toward the place diesels will take in supplying power for industry in the future, declared A. W. McKinney, vice-president of the National Supply Co. Mr. McKinney spoke yesterday at the annual meeting of the Oil and Gas Power Division of the American Society of Mechanical Engineers.

A. W. McKinney

All branches of the oil industry offer opportunities for diesels, Mr. McKinney said, pointing out that the industry responsible for the birth of the diesel engine, through its production of the engine's fuel, has been slow in adopting it to supply power for its own operations.

"In years past," Mr. McKinney continued, "there has been an abundance of cheap gas fuel available for gas engines and steam boilers in practically all oil fields. Then it was more economical for the operator to use a source of power utilizing what was considered the cheapest fuel. Now it is being learned that the natural gas is not so cheap as has been believed. New uses found for natural gas have increased its value to a point where diesel fuel can offer it very stiff competition.

"There are two comparatively recent technical advances responsible for this increased value of natural gas. The most important of these is the large number of gas conservation projects that are under way. Actually, these are not gas 'conservation' projects, but gas utilization projects, because the gas is returned under pressure to the formations so that it can continue its primary and vital function of helping to bring the oil to the surface.

"A second reason for the increased value of natural gas is its expanding use in the liquid fuel and the plastic and chemical indus-

(CONTINUED ON PAGE 142)

RUST REMOVED and ONLY Rust!
1 Some chemicals that are used to remove rust do not attack the metal beneath, it is true, BUT—They do not take off the rust either!
2 Other compounds would be very good as rust removers—except that they also remove a large amount of the good steel or iron beneath the rust.
3 NOX-RUST RUST REMOVER, however, satisfies BOTH essential requirements: it removes all the rust AND leaves the sound metal unharmed.

It took long research by skilled chemists in our modern laboratories to develop Nox-Rust Non-Corrosive RUST REMOVER. A scientific blend of active, "wetting" and inhibiting agents, it

(1) Rapidly loosens and dissolves rust
(2) Does not affect critical dimensions
(3) Leaves chemically clean surfaces that make excellent paint bases
(4) Is easily applied by dipping, wiping or brushing
(5) Is long-lasting and economical to use.

USES: Wherever rust has attacked tools, parts, machinery or equipment—and especially on machined precision surfaces such as bearings where close tolerances are held.

Other Nox-Rust products, covering the whole field of metal protection, and engineered recommendations by trained representatives, are available to all industry

Full details on RUST REMOVER and a new catalog of Nox-Rust products will be mailed on request. WRITE TODAY!

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NOX-RUST CHEMICAL CORPORATION

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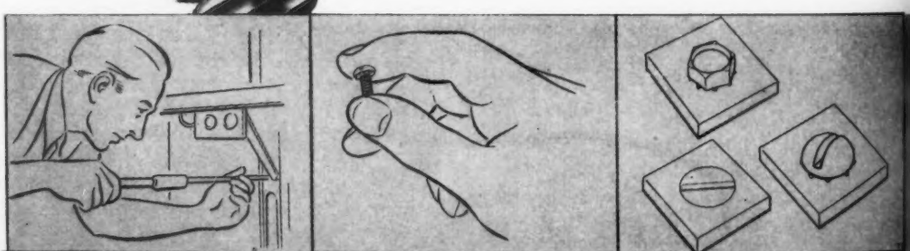
SEMS with recessed heads are also available from many manufacturers listed at right.

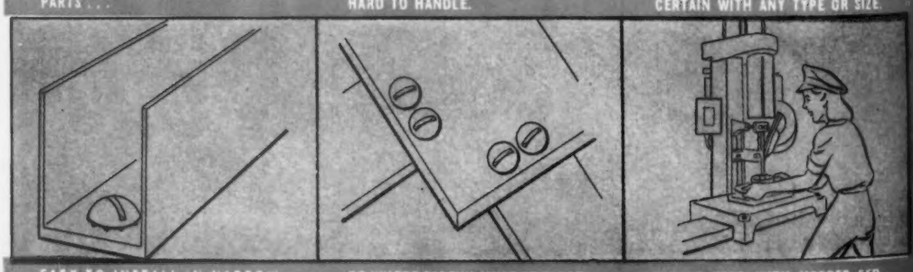
A Few of the Production Advantages of SEMS



PERFECT FOR HARD TO REACH PARTS . . .

OR WHEN SCREWS ARE TINY AND HARD TO HANDLE.

NEAT APPEARANCE ABSOLUTELY CERTAIN WITH ANY TYPE OR SIZE.



EASY TO INSTALL IN NARROW CHANNELS . . .

OR WHERE SCREWS MUST BE CLOSE TOGETHER.

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SEMS ARE PRE-ASSEMBLED WASHER AND SCREW UNITS IN WHICH THE WASHER IS HELD ON THE SCREW BY THE ROLLED THREAD AND IS FREE TO ROTATE.

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Chandler Products Corp.
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Continental Screw Co.
New Bedford, Mass.

Corbin Screw Division
The American Hardware Corporation
New Britain, Conn.

Eaton Mfg. Co.
Reliance Spring Washer Div.
Massillon, O.

The Lamson & Sessions Co.
Cleveland, O.

Manufacturers Screw Products
Chicago, Ill.

National Lock Co.
Rockford, Ill.

The National Screw & Mfg. Co.
Cleveland, O.

New England Screw Co.
Keene, N. H.

Pheoll Manufacturing Co.
Chicago, Ill.

Progressive Manufacturing Co.
Torrington, Conn.

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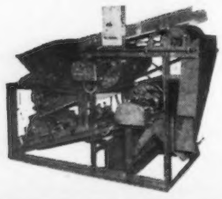
DINGS MAGNETIC SEPARATORS

Dings Magnetic Drums
Cylindrical shell revolves around stationary magnet. Separation is automatic.

. . . will handle your job!

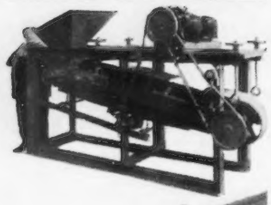
No matter how unusual or difficult a separating job you may have, there is a Dings High Intensity Separator that will handle it—with more positive results and less cost to you! This is made possible by the nearly 50 years Dings has spent developing magnetic equipment for the metal working industry. Write today for bulletins.

The Dings High Intensity Magnetic Pulley utilizes air-cooled construction and *bronze* spacer rings to provide complete, automatic separation. For use as head pulley in a belt conveyor system.

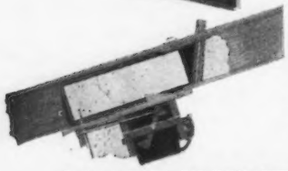


The Dings DA Magnetic Separator for separating ferrous and non-ferrous scrap. Two High Intensity Pulleys assure doubly clean separation. Feeder is reciprocating. Rubber covered idler adjusts gap between upper pulley and main conveyor belt.

Dings High Intensity Lifting Magnets feature a balance of copper wire and steel which is correctly proportioned to assure maximum lifting capacity with a minimum of weight and current input.



Dings High Intensity Type BN Separator. For separating mechanically entangled scrap. Combines magnets of alternate polarity with mechanical agitation to accomplish amazing results.



Dings High Intensity Type L Spout Magnets are designed for installation in chutes. Automatic gate discharges accumulated iron when current is interrupted.

DINGS MAGNETIC SEPARATOR COMPANY
516 E. Smith St.,
Milwaukee 7, Wisconsin

"Separator Headquarters"
Since 1899

Dings MAGNETIC SEPARATION HIGH INTENSITY

(CONTINUED FROM PAGE 139)

tries. Natural gas is just on the threshold in these industries, and its use will expand tremendously."

Important improvements in the design of diesels have been the more direct reasons for the heavy demand for the engines in the oil industry, Mr. McKinney said. Among these have been the improved power-to-weight ratio which allows greater mobility of the engines, and the production of dual-fuel equipment which allows an engine to be changed from diesel fuel to gas, or vice versa.

"The use of diesels in rotary drilling operations unquestionably is the most important. More than half the 4000 drilling rigs in the country are rotary outfits, but only a few up to this time are powered by diesels. In the past, natural gas had been cheap and plentiful as a fuel for gas engines, but this no longer is true.

"Another reason why diesels will become more widely used in drilling operations is the increasing demand for heavy-duty rigs for drilling 10,000 ft or deeper. Since drilling costs increase greatly with well depth, operators have to take advantage of every possible economy. It has been found that one of the most important economies is the use of a multiple arrangement of diesel engines to provide the required combination of operating economy, power and portability."

The foreign oil industry will become one of the diesel engine's most important markets, Mr. McKinney pointed out, because the foreign industry will expand tremendously in the next few years. This is inevitable, he continued, because, although the United States has only about six pct of the world's population, it produced more than 60 pct of the world's oil in 1945 and our estimated share of the world's oil reserves is only 32 pct.

"American oil field machinery unquestionably will dominate this foreign field, and it will be largely diesel-equipped because diesels have been the preferred source of power in foreign countries for many years and because an increasingly larger percentage of the operations will be exploratory drilling where gas will not be available for fuel."

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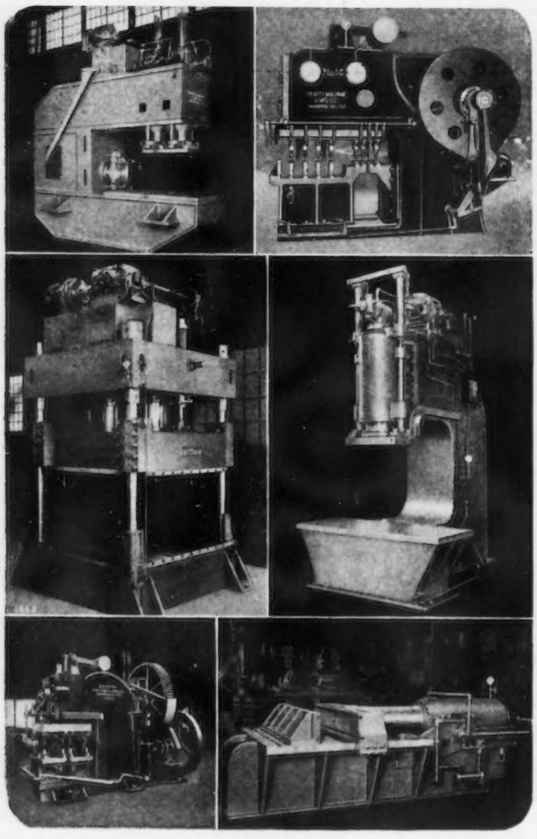

BENDING
BLANKING
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PUNCHING Structural Plate
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PERFORATING

HYDRAULIC PLATE & METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

Brazil Metal Society Combines Functions Of Metalworking Research

o o o

By HORACE A. HUNNICUTT

o o o

Rio de Janeiro, Brazil

• • • **The Associacão** Brasileira de Metais (ABM), Brazilian Society for Metals, held its second congress in Rio de Janeiro and Belo-Horizonte in the State of Minas Gerais, from May 14 to 24.

Brazilian industry is not specialized enough to support a separate society for each branch of the metals field, so the Brazilian Society for Metals resembles a combination of AFA, AIME, ASTM and others. Founded only three years ago, the ABM has an individual membership of 350 and some 50 companies hold supporting memberships.

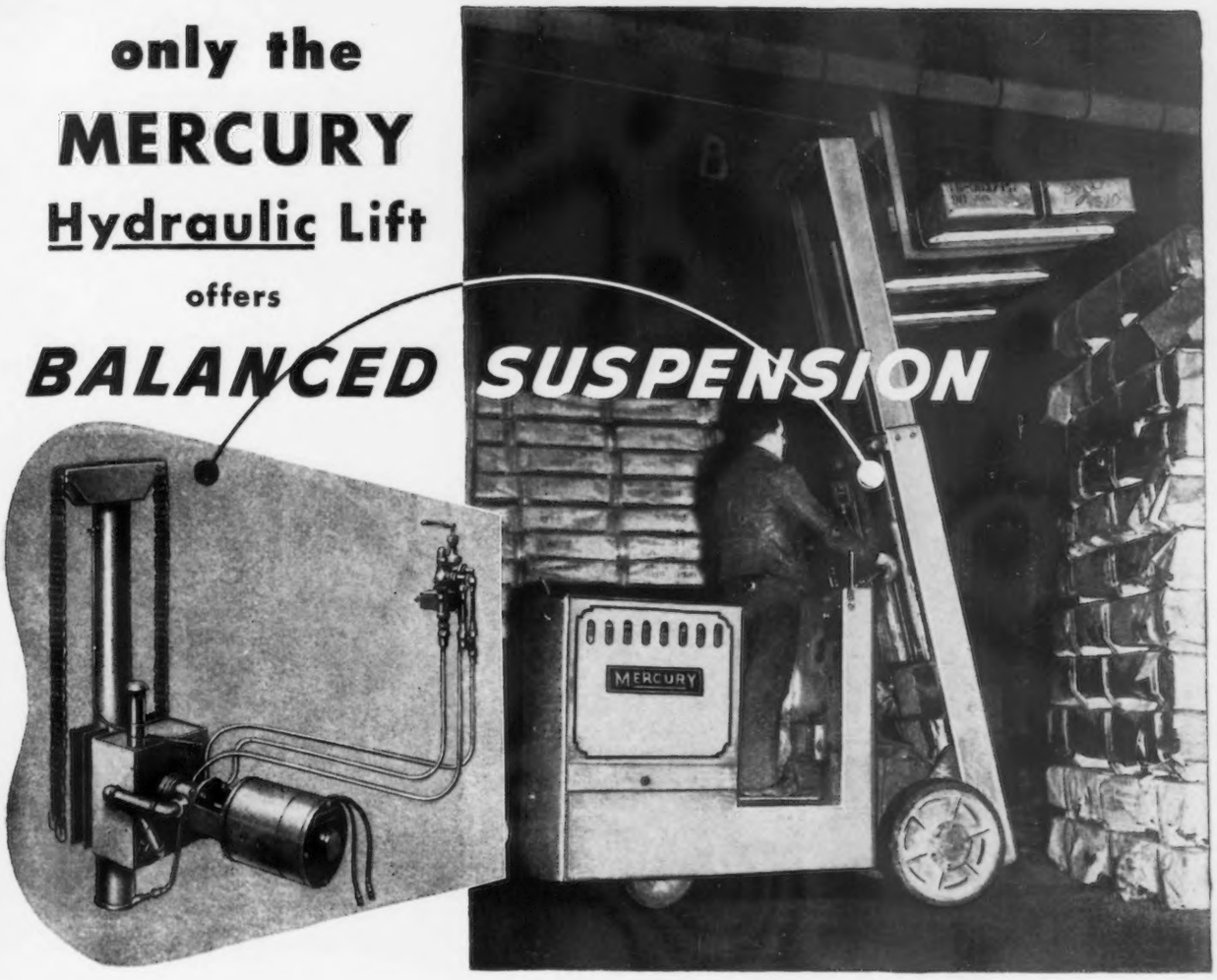
The spark plug of the ABM is its president and founder, Dr. Miguel Siegel, who is well known to many American firms and metallurgists. Dr. Siegel is recognized as one of the foremost metallurgists in Brazil. As organizer of its first model foundry at the Technological Research Institute in São Paulo, he is an ardent exponent of modern methods of treating and handling ferrous and nonferrous metals.

The ABM, by means of papers published in its "Proceedings," is building up a technical literature on metallurgy, heretofore nonexistent in Brazil.

The larger part of the papers present the subject in a simple manner for the maximum possible benefit. This is essential, for the development of a modern and efficient Brazilian industry is dependent upon the increase and training of a larger number of engineers and technicians. Many of the authors have drawn heavily from American and European technical literature, and are thus able to present to those Brazilians who cannot read foreign languages, collected opinions on metalworking trends and developments.

Two American metallurgists, Dr. Robert E. Mehl, of Carnegie

only the MERCURY Hydraulic Lift offers BALANCED SUSPENSION



Mercury engineers were the first to apply successfully the hydraulic principle to the lift mechanism of industrial trucks. The Mercury hydraulic lift offers these advantages:

1. **Balanced Load Suspension:** *Patented* cross suspension of fork carriage eliminates unequal strains created by off-center pick up of loads.
2. **Simple Design:** Requires less than 50% of the usual number of moving parts.
3. **Economy:** No power required to lower load—no power wasted in lifting.
4. **Safety:** Relief valve provides complete overload protection at all times.

The soundness of the hydraulic lift principle, and the important advantages it offers, are today widely recognized throughout industry. The Mercury lift, however, in addition to providing the usual advantages of the hydraulic system, offers the exclusive and patented "Balanced Load Suspension" feature, which prevents side loading of the ram even with an off-center load.

Other outstanding features of Mercury trucks are: Single-unit drive assembly . . . Snap action, cam-operated controller . . . All welded frame construction. These are but a few of the many reasons why Mercury Industrial Trucks enjoy wide preference in industry.

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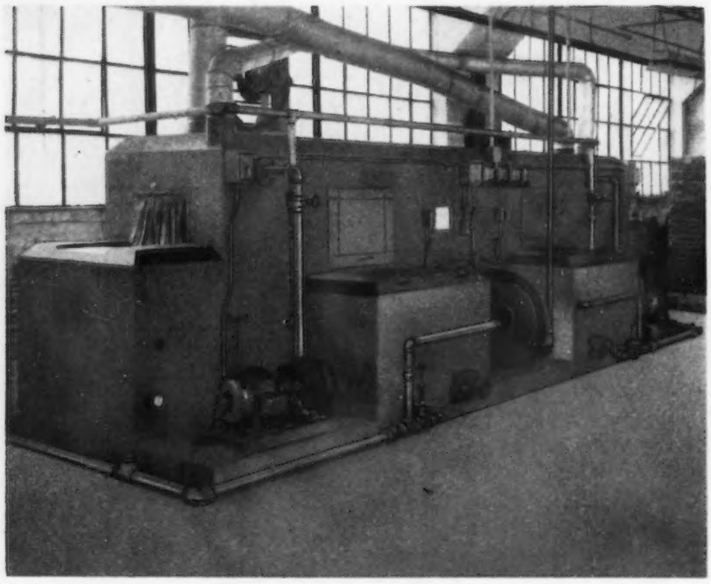

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Each model in the complete line of Detrex metal parts washers is designed for accessibility. Sprays are easily adjustable to completely cover all contours of parts being cleaned. Quick-opening inspection doors provide access to spray nozzles and headers, while other doors readily permit clean-out.

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Institute of Technology, and Dr. Arthur Phillips, Yale University, during their trips to Brazil, gave their support to Dr. Siegel and other engineers during the formative stage of the society. In fact, the ABM has published a Portuguese edition of a book by each of these men, especially written for Brazilian conditions entitled "Metallurgy of Iron and Steel" by Dr. Mehl, and "Nonferrous Metals and Alloys, Properties and Uses" by Dr. Phillips.

Steel Production In Luxemburg in March Reaches 97,460 Tons

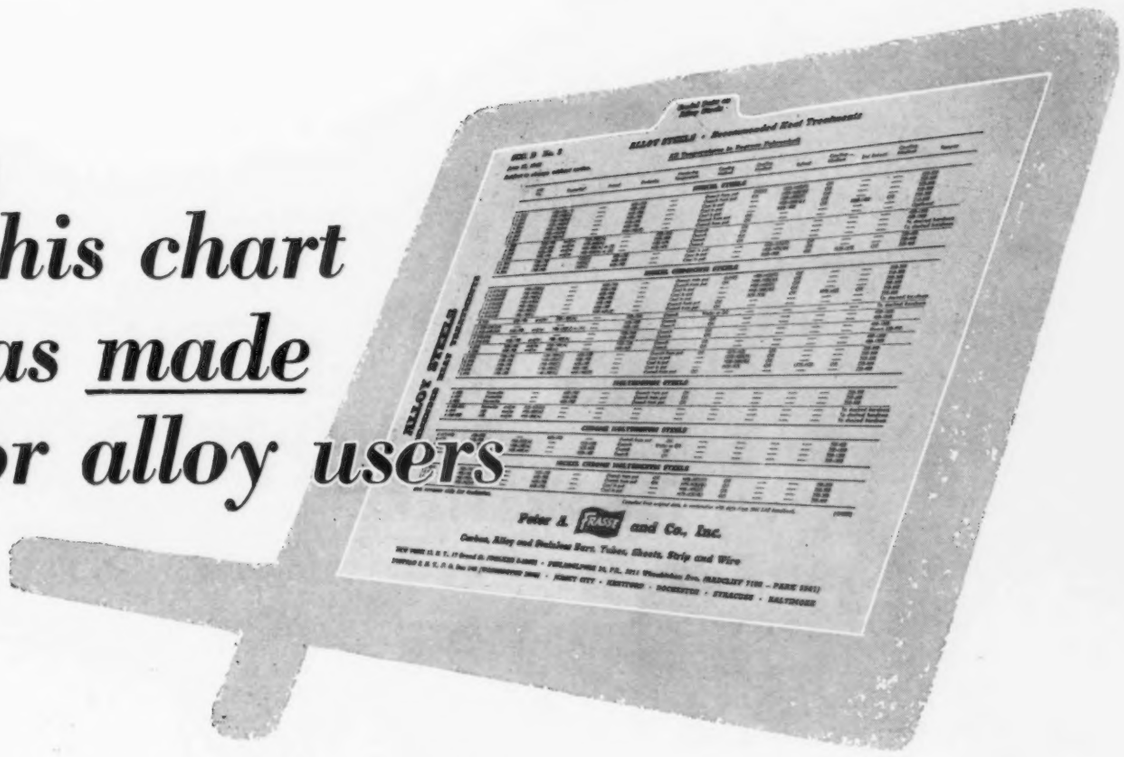
Paris

• • • **Steel production** in Luxemburg in March amounted to 97,460 tons, corresponding to an annual production of 1,147,300 tons, as against 2,750,000 tons in 1937. ARBED, one of Luxemburg's large iron and steel companies, in its recent report stated that during the German occupation there were substantial losses, due to the constantly decreasing output since 1942 and to the war damage suffered by the company's works in Luxemburg and Germany. The total loss is estimated at several hundred million francs, and although the works have resumed production to a certain extent, they are for the time being working without profit.

The report goes on to say that in the monetary field there is complete chaos, since several nations have established fixed exchange rates for the various currencies, rates which are rather questionable as the respective currencies have not been stabilized on a gold basis. World economy is based only on unstable currencies, and this will go on until the nations have based their currencies on gold again.

As for the company's future prospects, the report says: "We do not know whether we shall be able to obtain the indispensable raw materials for our industry, mainly coke, which is 'bread' for our blast furnaces. We do not know what the sales prices will be and whether they will enable us to compete successfully with foreign firms whom we find in the markets to which we used to sup-

This chart was made for alloy users



In this new chart, Frasse has *condensed* alloy heat treat procedure to a *single* file size card. With it, you can check heat treatment for any one of 60 standard steels — in 30 seconds flat!

How is 4615 treated for automatic quenching? What's the normalizing temperature for 4130 . . . the recommended cooling rate for annealing 6145? With this new chart, you can answer hundreds of similar questions with *speed* and ease.

The single card gives all salient data for normalizing, annealing, hardening, carburizing and reheat. Shows recommended cooling medium, tempering ranges and precautions to follow. Slip it under glass or tack it on the wall — and you have alloy heat treatment summarized at a glance!

Here's a handy checking tool for metallurgists and heat treaters . . . an invaluable guide for technically-minded buyers. Before you mislay the coupon—mail it for your free copy today!

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A 3135
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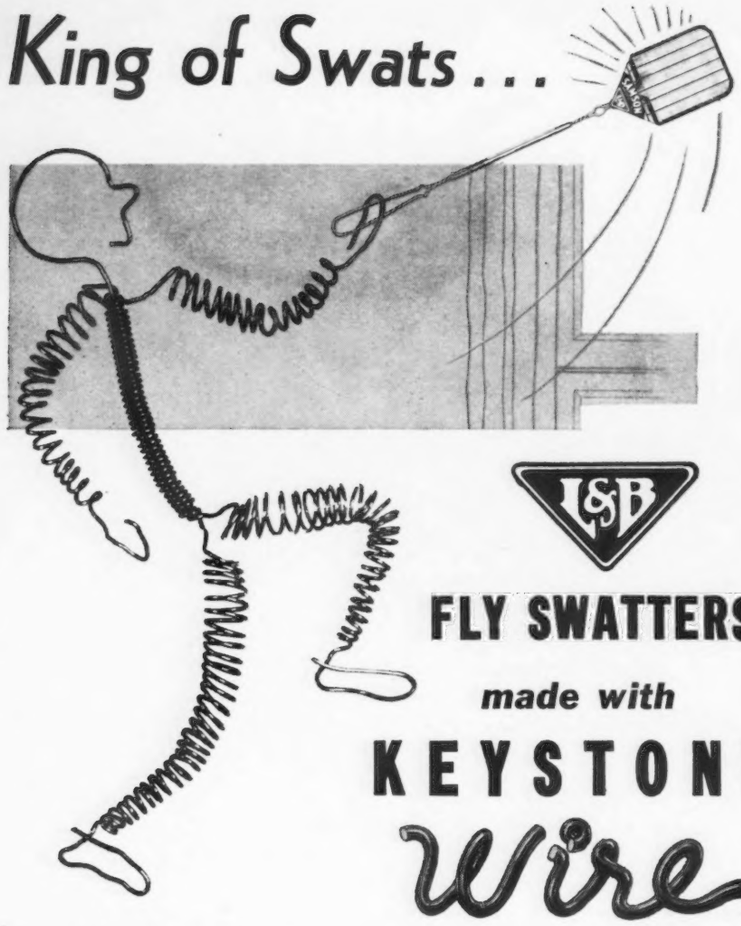
X 4130
A 4150
X 4340
A 4615
A 6145
A 6150
A 8620
NE 8630
A 8735
NE 8740
A 8742

King of Swats . . .



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Ever try to sneak in a short snooze on a hot summer afternoon, only to have a fly give you the buzz? That's when you're ready to do battle . . . no holds barred! The skirmish will be short and sweet with an L & B swatter . . . you're assured of an .800 batting average, or better . . . then you can resume your nap in peace.

But the Lubbers and Bell Company wasn't napping when they made their L & B swatter . . . top grade materials were used throughout . . . special finish Keystone wire handles, as an example.

Yes, uniform wire quality means a lot to Lubbers and Bell — just as it is important to *any* mass-production manufacturer. We are indeed proud that Keystone wire fulfills their exact needs, with steady, sure quality. And Keystone wire is helping hundreds of other manufacturers in just the same way.

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Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE — REG. U.S. PAT. OFF. — KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

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ply our products before the war. We do not know what economic system the new world is going to adopt, whether the tariff barriers existing before the war are to be increased, or whether it will try to return to greater freedom of exchange. We do not know whether we shall be able to overcome the shortage of labor which is so difficult to get over. Lastly, we do not know what we shall get from our works and our foreign investments, mainly those in Germany."

At the end of 1945, the total loss sustained by the company amounted to 1152 million francs ($9½ million). This includes war damage and charges paid by the company in respect of salaries and wages to workers and employees when there was no production, as well as allowances to those deported and who suffered war damage.

The problems of the company as stated in the report indicate the uncertainty in industrial quarters regarding the political situation generally, and the difficulties confronting managements of industrial undertakings regarding supplies of raw materials, particularly coal.

Instrument Society Plans First Meeting

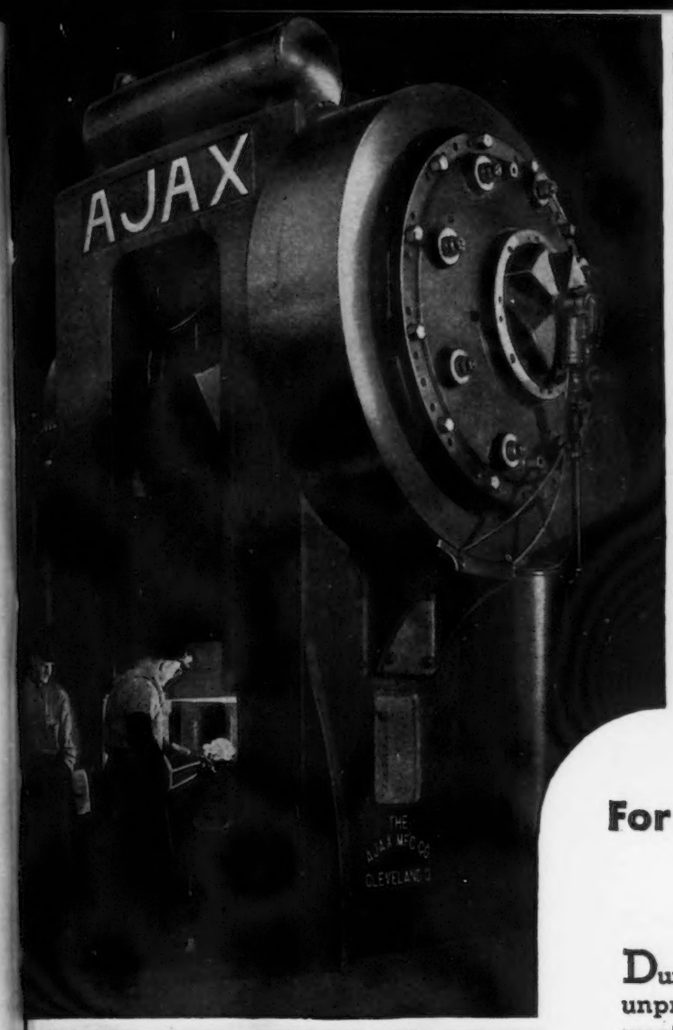
Pittsburgh

• • • **The first** National Instrument Conference and Exhibit, planned to promote wider use of instruments, will be held Sept. 16-20 in the William Penn Hotel, Pittsburgh.

Meeting jointly during the same week will be the Instruments and Regulators Division of the American Society of Mechanical Engineers, who have arranged for three technical sessions.

The Pittsburgh General Committee of The Instrument Society of America under the chairmanship of R. J. S. Pigott has arranged a technical program of 15 sessions.

Short courses in industrial instruments, machine shop measurements, optical measurements, and electrical measurements are being arranged at the Carnegie Institute of Technology under the direction of Dr. B. R. Teare, Jr., head of the electrical engineering department. These short courses will consist of five 2-hr sessions.



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2216

Captured Technical Documents Available To Industrial Groups

Dayton

• • • **The Air Documents** Research Center, A-2, U. S. Air Forces in Europe, which was organized in London for the purpose of collecting and processing captured air technical documents, has recently been moved to Wright Field, Ohio, where the project is being continued by the Air Documents Div., Intelligence, T-2, TSRED. Approximately 220 tons of documents, plus a smaller quantity received by Wright Field prior to the establishment of the London organization, are now in process of being cataloged, indexed, abstracted, translated and analyzed.

It is the desire of the AAF to make all of this foreign technical data available to the aeronautical industry, research agencies, and educational institutions at the earliest possible date. To this end the steps outlined below have been or will be taken.

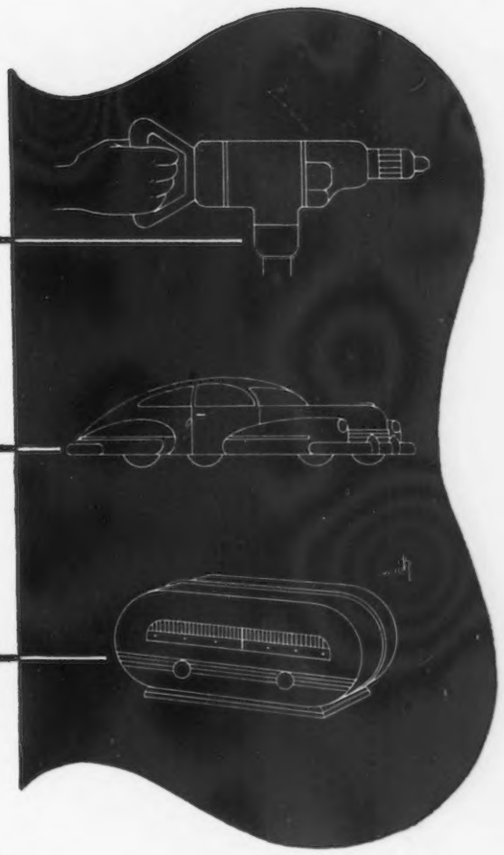
Government, industrial, and research agencies in the United States have previously been advised of the availability of the German ZWB card index of all documents which were issued by this central German agency. Distribution of this index in microfilm form has been made to those agencies that have so requested. These ZWB cards were later translated by the Air Document Research Center and microfilm copies of the translated cards were likewise made available and distributed to interested agencies.

All foreign documents that are now located in the Air Documents Div. at Wright Field, or are to be received in the future will be cataloged in a card index to be called the Air Documents Index (Tech.), (German, Japanese, etc.), T-2, Hq. AMC, USAAF.

In order to make information regarding captured documents available to agencies in the United States that can make use of information contained therein, distribution of the copies of the card index will be made to those agencies which are willing and able to establish and maintain the catalog file.

It is planned that enough card

DO THEY...



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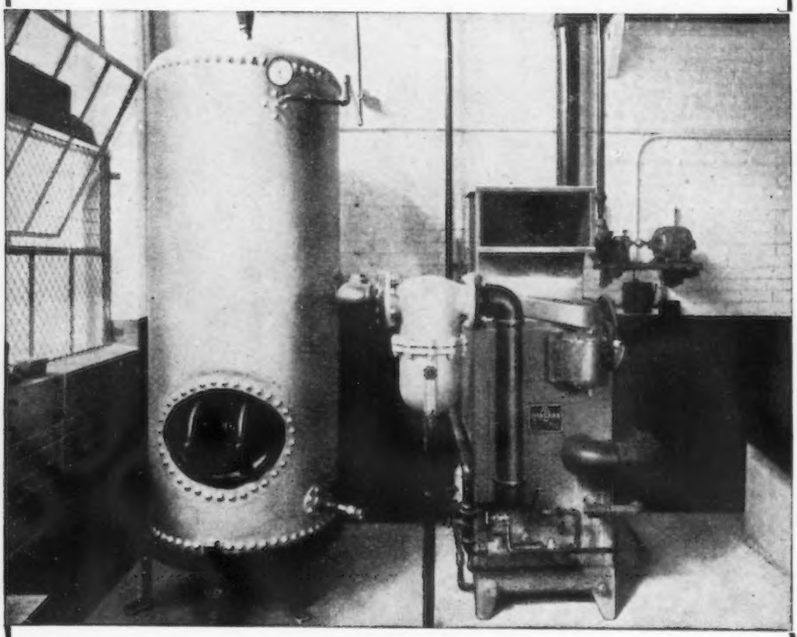

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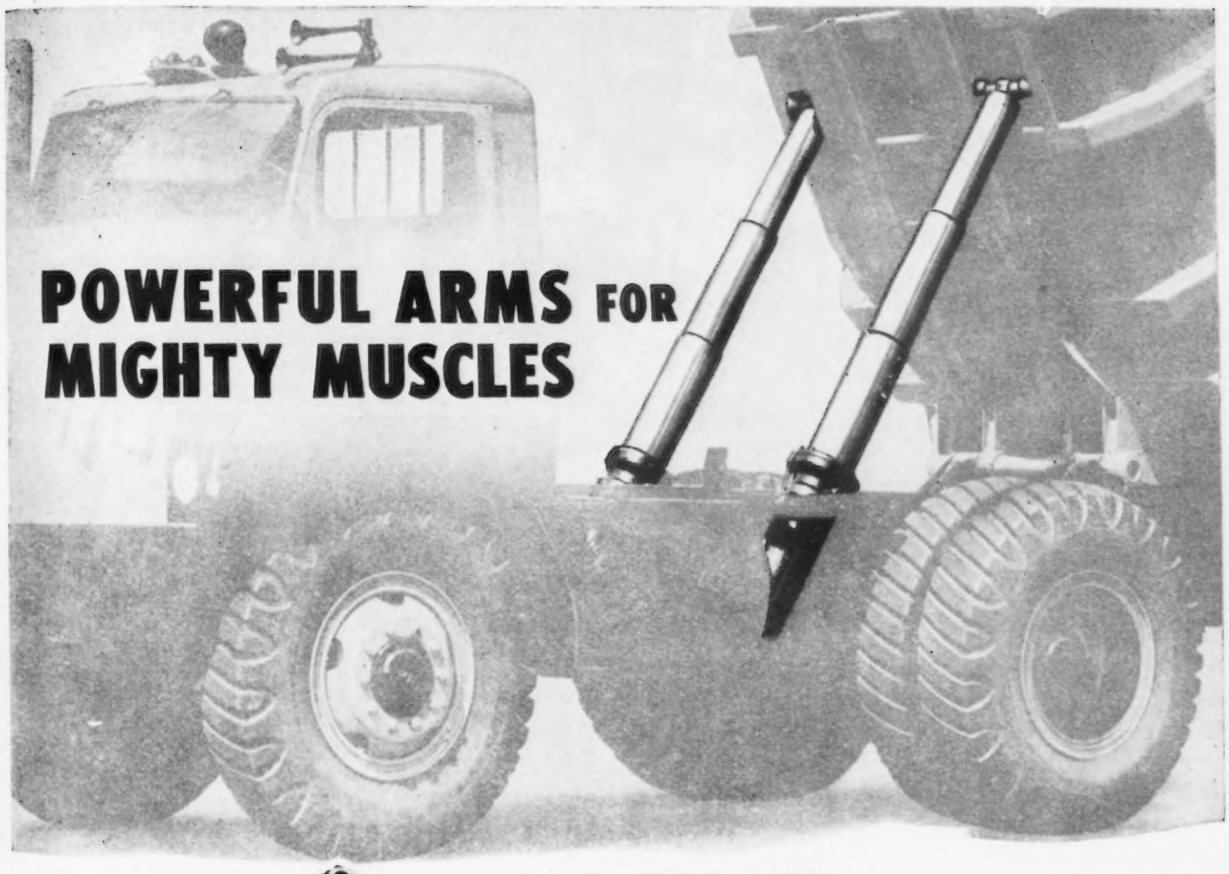
files will likewise be established in different parts of the country so that there will be available, within a reasonable distance, files for reference by those agencies which are not able to maintain their own. At present approximately 4000 documents (20,000 cards) have been cataloged and cards for those documents have been printed and are ready for distribution. Cataloging of remaining documents will proceed at the maximum possible rate that can be attained with available personnel.

Cataloging of drawings and blueprints presents a different problem from that of reports. It is planned to have the general assembly or three-view drawing of each item of equipment, such as an engine, cataloged as a document. The index card will contain a short description of the item and will list major assemblies for which detailed drawings are available. Upon request a drawing will be forwarded for any item or assembly and copies of selected drawings will then be made available upon request.

The following plan is to be instituted for dissemination of the valuable information contained in the captured foreign documents. Copies of the card index will be furnished free of charge to those agencies which will certify to an agreement to establish and maintain a complete card catalog file. A list of locations of files available for reference to those unable to maintain such a file will be furnished all other agencies. It is emphasized that this index is expensive to print.

It will require an estimated total of 15,000 man hours of endeavor for each agency which sets up a complete file. An index should not be requested unless the expense involved in setting it up and maintaining it is justified.

Attention is called to two recent Executive Orders No. 9568 of June 8, 1945, and No. 9604 (Extension and Amendment of Executive Order No. 9568) setting up the Office of the Publication Board, Room 1310, Dept. of Commerce Bldg., Washington 25, D. C. Once a document is declassified by the Air Documents Div., it will be sent to the Publication Board and will then be available from that office. The Air Documents Div. will continue to disseminate declassified data to government, military and



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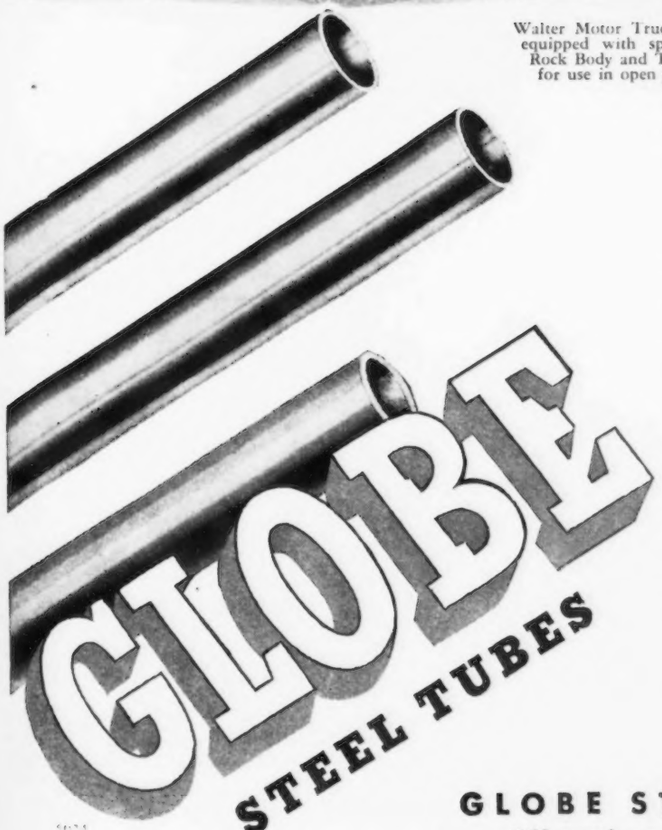

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naval agencies upon request. Classified documents will be distributed as explained below.

The problem of translation alone presents tremendous difficulties in that many new technical terms were coined by the Germans during the past ten years, and no adequate German-English dictionary is presently in existence. The Air Documents Div. is currently editing new terms for publication in a technical German-English dictionary and to date has accumulated approximately 23,000 terms.

There will be about 40,000 in the published edition of this dictionary. In exchange for the card index of documents and microfilm copies of the documents themselves, each agency will be requested to assist in the translation or preparation of digests and evaluation reports for the documents received by them, or, in the event that the document is not of sufficient value to warrant translating or digesting, to furnish a brief abstract.

The Air Documents Div. will publish a bulletin informing participating agencies of all documents that have been translated or are in process of translation, so that duplication of translation will be kept to a minimum.

General policy is to declassify all foreign documents so that the widest possible dissemination can be made. There will be some few documents, however, which of necessity must remain classified, and distribution of these documents can only be made to those agencies which have signed and have in force the standard secrecy agreement. A separate classified card index is planned for these documents.

In addition to the index cards mentioned above, plans are being made to distribute in loose leaf form bibliographies of foreign documents available on certain subjects.

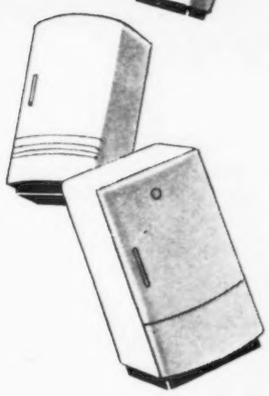
Approves Steel Silos

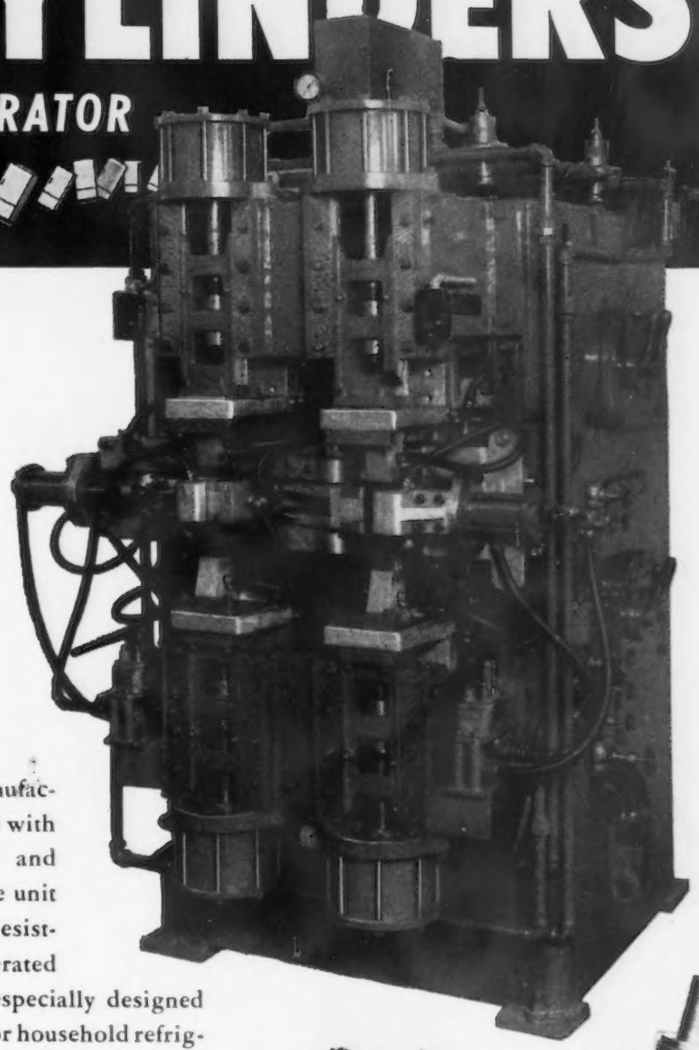
Paris

• • • **M. Peissi,** director of the French technical office for the use of steel, recently pointed out the advantages from the technical viewpoint of steel elevators (Silos) for the storage of grain. He said that the world's largest is in French Morocco, with a capacity of 11,000 tons.

Production Welder with T-J CYLINDERS

SPEEDS UP REFRIGERATOR ASSEMBLY!





One of the largest refrigerator manufacturers uses this equipment—designed with T-J Air Cylinders—for top-speed and efficiency in production welding. The unit is a Special Four-Head Air Operated Resistance Production Welder with air operated work clamping and locating fixture especially designed for welding the base frame assembly for household refrigerators. The equipment is manufactured by National Electric Welding Machines Co., Bay City, Michigan.

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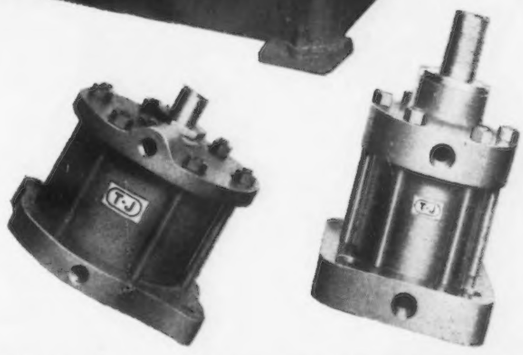

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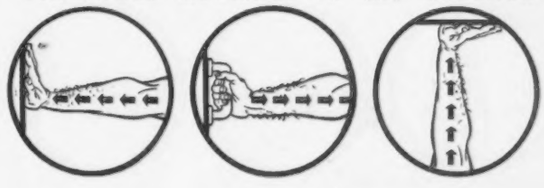

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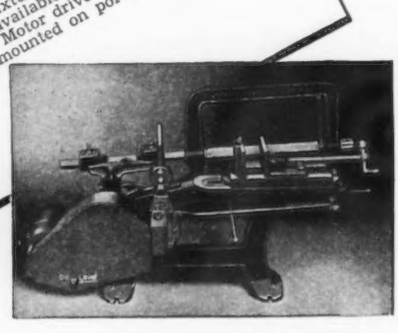

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ARMSTRONG-BLUM MFG. CO.
5700 Bloomingdale Ave., Chicago 39, Illinois, U.S.A.

The London Economist

(CONTINUED FROM PAGE 123)

freedom of some member of the family to search for food. In this battle the old and the families of young children fare the worst, and the old certainly wear the mask of hunger most visibly.

A YEAR of clearance and the effects of weather have greatly decreased the dramatic quality of the physical destruction. The wilderness of rubble, pipes and twisted girders has taken on a settled air. Most of the main streets are cleared and the debris has been piled inside the broken walls. Here and there enough of the shell remains on the ground floor to rebuild the lower walls to provide a small shop window or to shelter a family. Among what seem to be uninhabitable ruins a line of washing or curtains give evidence that a family still perches there. Inside the standard of cleanliness remains astonishingly high—a factor which has been important in maintaining the health of the people—in spite of leaking roofs, overcrowding and an almost complete absence of cleaning materials. As an example of the extent of damage in the most heavily bombed part of Essen a survey of miners' houses revealed that 72 pct of the houses round one mine had been totally destroyed and 10 pct heavily damaged, and that near another mine 49 pct had been totally destroyed and 50 pct heavily damaged. These are extreme instances covering only 4,500 houses occupied by miners in the area, but they present a grave enough problem in themselves.

From the aspect of the general standard of living in the Ruhr it appears that an acute crisis is not in existence at this moment, but that the reserves upon which the Germans have been drawing must be very near exhaustion. Any reduction in the food rations would precipitate a crisis of unpredictable proportions, for the margin of safety is now so narrow that it would need only a slight worsening of the situation to destroy the whole industrial and administrative edifice. However unwise the major decisions on the level of industry may be, and however calamitous their results turn out, the present situation reflects a remarkable power of survival among the German people, which should be met with every conceivable effort if a collapse is to be avoided.

Coal Replaced Wood In Making Swedish Steel During World War II

New York

• • • **Using wood** and straw as substitutes for coal and coke the Swedish steel industry actually increased production during the war. This is disclosed by Magnus Tigerschiold, writing in the British paper, *Iron and Steel.*

In 1939 the steel industry consumed about 600,000 tons of coal, he states. During the period July 1, 1941 to June 30, 1944 the government cut the steelmakers to 30 pct of their normal consumption, and by July 1945 coal supply was at 7.5 pct of the prewar level, where it remained for the rest of the year. All the openhearth furnaces, and the main part of the reheating furnaces for the rolling mills, had to use wood as fuel; many experiments had to be carried out and modifications of the plant made, before the technique of economically heating these furnaces with such low-grade fuel was mastered.

By the autumn of 1945 the situation had become most difficult, and straw (from rye, oats and wheat) was introduced as a fuel in the iron and steel works. At one plant as much as 20 pct of the total fuel used consisted of pressed-straw bales, and an old blast furnace was rebuilt as a gas producer, using this material as fuel; this producer is operated with hot blast, and slag is tapped off in the molten state. One openhearth furnace and several reheating furnaces are still heated with gas from this source.

The annual production of charcoal (before the war about 290,000 tons) was raised to about 850,000 tons, of which amount about 350,000 tons were used in the blast furnaces and 490,000 tons for the propulsion of automobiles, trucks, and buses. The quantity of wood used directly for the latter purpose was of about the same magnitude, reckoned in heat units.

The achievement of the level of production attained, and the maintenance of that production, would have been impossible but for small imports of coke and coal from abroad, and for the fact that a great proportion of the wood in-

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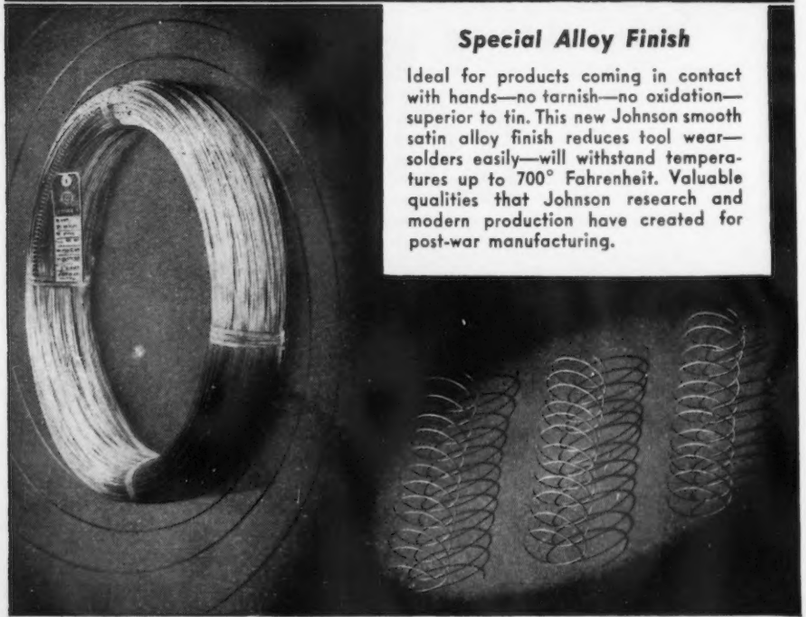
JOHNSON XLO Music Wire



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NEW YORK AKRON DETROIT CHICAGO LOS ANGELES TORONTO

tended for the pulp industry was available for use as fuel.

Fortunately, the water supply during the last 3 yr was exceptionally good, so that a very high output of energy was obtained from the hydroelectric stations. Many electric steel furnaces and annealing furnaces were built during the war but, owing to the shortage of graphite electrodes, hydroelectric power could not be utilized to the full extent in the steel furnaces.

It is well known that the fuel consumption (per ton of product) in the blast furnace diminishes as the iron content of the burden increases. The Swedish magnetite ores are easily concentrated, and it was found economical to use such concentrates (in sintered form) in the blast furnaces, in amounts of up to nearly 100 pct of the total ore burden. By this and other means it has been possible to reduce the charcoal consumption, which in 1900 was 25 cwt per ton to an average of about 15 cwt per ton (1 cwt = 112 lb). At the same time the production from an average of 4000 tons per unit per year to as much as 30,000 tons for the largest of the charcoal furnaces.

The coke blast furnaces have followed the same trend, with the result that today the distinction of producing iron with a coke consumption lower than anywhere else in the world is held by the Swedish blast furnaces. At one plant making Thomas (basic) pig iron the coke consumption has brought down to 13 cwt per ton of iron, the ore burden consisting exclusively of sintered concentrates. Because of the richness of the burden, the slag quantity is only 940 lb per ton of pig iron. The blast temperature is held at about 750° C. The furnaces in question are only 54 ft 7 in. high and the production is approximately 200 tons per day per furnace.

A remarkable innovation is that at many Swedish blast furnace plants today the main part of the limestone requirement of the burden is mixed with the ore concentrates before sintering. By this measure a saving of about 110 lb of coke per ton of pig iron has been obtained. This good result is also, to a large extent, attributable to the quality of the sinter now produced. The sinter must

not be too hard-burned and its structure must be porous and similar to that of coke. If certain measures are taken, it is possible to obtain quite a strong sinter (strength is also essential) and at the same time lower the consumption of coke fines in the sintering process.

At any reconstruction of the blast furnaces during the period of the war, opportunity was taken to increase the hearth diameter but the bosh diameter was not altered, and the hearth-diameter/bosh-diameter ratio is often as low as 1 to 15 or 1 to 20; this applies to both charcoal and coke blast furnaces.

Great care is taken to maintain a chemically uniform as well as physically uniform burden.

As has already been mentioned, the fuel consumption in the charcoal furnaces has also been brought down to a very low figure. In the best furnaces a consumption of 13 to 14 cwt of charcoal per ton of pig iron is expected when sintered ore is exclusively used and the blast temperature is held at about 600° C.

The low coke and charcoal consumption in the Swedish blast furnaces naturally results in a low heat value of the blast-furnace gas, this value being very often as low as 84 B.t.u. per cu ft. The quantity of gas naturally also decreases and in the best furnaces this quantity falls to about 78,000 cu ft per ton of pig iron.

In a country where fuel is expensive, it is very important that the blast-furnace gas be used economically and completely For heating the blast regenerative-brickwork hot-blast stoves are used at only two plants in Sweden. At all of the charcoal blast furnaces, and at several of the coke blast furnaces, metallic recuperators are used for preheating the blast. With metallic recuperators made from heat-resisting steels it is possible to reach blast temperatures of 700° C and, with the latest constructions, possibly 800° C.

Practically all of the Swedish charcoal blast furnaces today are using Lindblom-type recuperators for heating the blast. The apparatus has been built in sizes of from 1075-3230 sq ft of heating surface. Generally, a heat-trans-

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Model 11020A

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Reverse Gear Bracket	2
Gear Box	10
Headstock	7
Automatic Apron	6
Carriage Assembly	4
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TOTAL	39

*All models of Logan Lathes are similarly protected.

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LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS

mission factor of 3.6 Btu per sq ft per deg C is obtained, which implies a mean heat-transmission by the tube surface of about 1500 Btu per sq ft per hr.

In order to obtain a higher air temperature the Industrikemiska Aktiebolaget in Stockholm developed a new superheater (INKA) for air, gas, or steam, consisting of vertically (or nearly vertically) arranged straight tubes for superheating the air. The tubes are fed from a ring main and discharged into a circular collecting-tube, the latter being connected to the service main.

The apparatus is heated by hot waste gases or by means of a gas burner which is specially built for the purpose of obtaining a very rapid combustion of the fuel gas.

This apparatus, working with parallel flow which makes possible the attainment of a very uniform and very high tube temperature up to 930° C over the entire length of the tubes, allows the procurement of a high heat transmission —up to about 10,000 Btu per sq ft of tube surface per hr.

To obtain a high thermal efficiency the heat of the flue gas from this apparatus must be utilized, preferably in an air preheater, from which the preheated air at temperatures of 450° C can enter the INKA and be superheated there to the temperature required. Today air temperatures of 800 C° are regularly being maintained by such apparatus.

Armco Expands Coke Plant

Middleton, Ohio

• • • **The American Rolling Mill Co.**, will construct 25 new coke ovens at its Hamilton, Ohio plant at an estimated cost of $1,275,000. In addition, the company will spend $300,000 repairing existing ovens.

The Koppers Construction Co., has been awarded the construction contract. Work will be started within a few weeks and it is anticipated that the new ovens will be in operation next April.

When the new units are completed the number of ovens in the battery at Armco's Hamilton plant will total 110. The company is making the addition to increase its supply of coke which is used in making pig iron.

WAA Appoints Kirby As Surplus Director In Chicago Territory

Chicago

• • • **William T. Kirby** has been appointed deputy regional director for real property disposal in the Chicago region of the War Assets Administration.

Mr. Kirby will have charge of all WAA surplus real estate, including war plants, in the northern half of Illinois, the northern half of Indiana, upper peninsula of Michigan, and the entire states of Wisconsin, Iowa, Minnesota, and North and South Dakota. In addition to the office in Chicago, he will operate a sub-office in Minneapolis.

Charles G. Wiese has been named sales manager in charge of textiles. He retired Dec. 31, 1945, as secretary and treasurer of George B. Carpenter & Co., wholesalers of heavy hardware.

Twenty-four acting staff appointments also have been made, as follows:

Frank F. Fisher, Jr., special assistant to the director; Robert W. Chicoine, administrative assistant to the director; J. W. Morrey, deputy regional director, office of regional management; Earle S. Barber, deputy regional director, office of regional disposals; Harry H. Abbot, deputy regional director, office of regional operations; Charles J. Folger, chief, consumer goods div.; William F. Coleman, chief, capital and producers goods div.

W. C. Peterson, assistant deputy regional director, regional operations; Louis A. Hebert, director, office of research and statistics; Lee Walker, regional counsel; William R. Crawford, director, office of information; Carman Thomson, chief, advertising div.; Eugene A. Figus, chief, budget div.; Joseph Apsley, chief, organization, planning, and procedure div.; M. D. Shaw, chief, personnel div.; Hal S. Wilson, chief, finance div.; L. P. Madsen, assistant chief, finance; Kenneth L. Cooper, chief, administrative services div.; Harvey S. Nelson, chief, credit div.; W. D. Eck, assistant chief, credit;

AUTOMATIC SCREW MACHINES

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Stuart's

ThredKut ThredKut 99 SPEEDKUT SUPERKOOL Base

STUART engineers have seen it many times—the almost startling improvement in performance when one of those four Stuart products is substituted for an ordinary "getting-by" oil on a screw machine operation. The reasons for the difference are nothing mysterious. Stuart's ThredKut 99, ThredKut, SuperKool Base Blends and SpeedKut are heavy duty, high anti-weld, high lubricity oils which make improved finish and longer tool life possible—their high quality insures protection for precision machinery. Their use insures optimum production results by increasing the efficiency of automatic precision machines. That is why so many of the largest, oldest, screw machine products plants use Stuart Oils.

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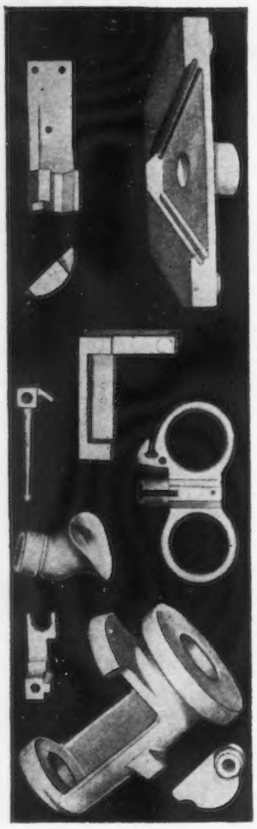

An OPEN LETTER on

MODERN PRECISION CASTING

If you are now producing small metal parts by conventional methods of casting, forging or machining, you may be able to realize substantial savings in production costs by using precision casting methods.

Developed to meet wartime production demands, this new process may be applicable to your products particularly if machining costs are high or runs are short with high costs.

Precision casting is being used today to produce a wide range of parts in ferrous and non ferrous metals including high temperature alloys and varying in size from a fraction of an ounce to several pounds.

Compared to other industrial equipment, the cost of a complete precision casting plant remains surprisingly low.

As a dealer in precision casting equipment and supplies we offer detailed information to set up and operate a precision casting plant for your production.

Descriptive circulars of equipment and price lists of supplies furnished on request.

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Successor to J. Goebel & Co.—Est. 1865

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ACCURATE, HIGH-SPEED SPRING PRODUCTION

With Torrington Spring Coilers

All fourteen models of Torrington Manufacturing spring coilers are noted for accuracy and speed. With torsion or other available attachments, standard models will make almost any useful spring. Wire diameters range from .003" to .750". For catalog or quotation, write stating wire diameter *range required.*

W-11 SEGMENT TYPE SPRING COILING MACHINE

Wire Diameter Range: .015" to .072"

Wire Length per Spring: 0" to 42"

Coil Range (O.D.): 3/32" to 1-9/16"

The

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TORRINGTON, CONNECTICUT

Charles H. Rioch, chief, priorities and special services div.; William B. Rayburn, chief, on-site sales div.; H. M. Magid, chief, special products div.; D. A. Decker, chief, scrap disposal div., and J. G. Petritz, chief, warehousing div.

Farm Machinery Output Reflects the Effect Of Industrial Strikes

Washington

• • • **Farm machinery production** in April continued at the relatively low March production rate, reflecting the effects of the coal and other strikes, CPA has announced.

While the April production of $48,591,534 was virtually unchanged from the March figure of $48,591,809, there were wide variations from the previous month in the production of individual farm machinery products. The April production figure, however, is 12.6 pct below the total production of $55,611,865 in April 1945.

The greatest production drop was recorded in wheel-type tractors which decreased 20.5 pct to $7,947,090 from the $9,999,120 in March. Unit production of tractors declined to 11,825 units compared with 14,901 in March, 12,503 in February, and 22,342 in January 1946.

Other major decreases were shown in planting, seeding and fertilizing equipment, which dropped to $1,132,039, a decrease of 23.4 pct from the $1,477,801 March total, while the production of repair parts decreased 3.3 pct to $11,305,693 from the March total of $11,694,507.

Increases in the heavy types of farm machinery included an 18.9 pct upturn in harvesting machinery, a 57.8 pct gain in haying machinery and a 42.1 pct jump in machines for preparing crops for market or use. These increases in production of heavy types of farm machinery as compared with March 1946 may be misleading because the production of these items in April show substantial decreases from production figures for April last year.

Shipments of Iron Ore From Normandy to Britain Resumed Again

Paris

• • • **Ore shipments to** Britain from Normandy have started again and can be expected to make progress if transport and the harbor installations at Caen can be restored quickly. Normandy's iron ore mines (Dept. du Calvados, de l'Orne et de la Manche) had a prewar production of about two million tons per year of high silicon or mixed hematite and sparry iron ore. This mineral ore was used locally (Mondeville) or in the works of northern France, and a considerable proportion, amounting to about two-thirds, was exported for use in Belgian, British, German and Dutch works. A total of about 600,000 tons was shipped overseas from Caen each year, the rest going by rail.

Owing to the war there was much interference with the production of these mines which was considerably reduced until the armistice of 1940. Some mines, such as Dielette, Soumont, La Ferriere, Mortain and Urville, came to a complete standstill. Since then production has been as shown in table I.

All the mines came to a standstill after the landings of June 6, 1944. The Dielette mine, which supplied magnetic ores and was worked under the sea, was inundated in 1940 as the pumps did not work owing to lack of current. Several mines have not yet been able to resume operation owing to destruction by bombing or artillery bombardment. It will take several years to restore them. However, La Ferriere, Halouze and St. Remy sur Orne have resumed production at a reduced rate. The Mondeville mine, which belongs to the Societe Metallurgique de Normandie (near Caen), was almost completely destroyed by bombing and will not be able to resume production for a long time.

TABLE I

	1941	1943	1944
May sur Orne et St. Andre	192,841 tons	256,300 tons	44,748 tons
St. Remy	164,639 "	190,965 "	23,199 "
Soumont	200,587 "	271,730 "	55,796 "
Urville	13,491 "	25,591 "	8,288 "
Mortain	11,832 "	13,370 "	discontinued
Halouze	95,251 "	94,450 "	29,682 tons
La Ferriere	140,245 "	97,251 "	23,295 "

RCA Exports WAA Surplus

Washington

• • • **WAA and the** International Division of the Radio Corp. of America have signed the first contract to establish agencies for export sale of surplus electronics material in over-supply. The RCA International Division will receive from WAA only material which has been declassified as nonsecret by the Army and Navy and material for which there is no demand in this country, WAA said. Under terms of the contract, the agent will inspect, test, and when necessary rework the material prior to sale. Sales will be made for cash, and title will pass to the foreign purchaser before the material is exported, according to contract terms.

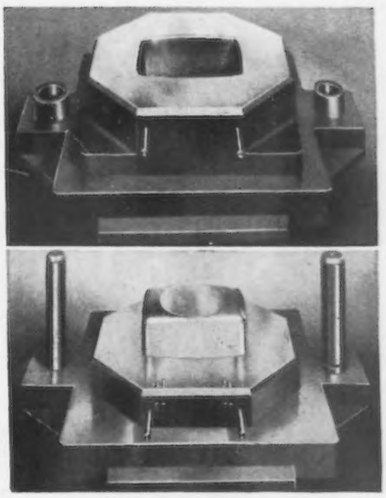
Canadian Lead Rate Up

Ottawa

• • • **While production** of primary lead, zinc and silver for March showed a gain over the preceding month, it fell below that for March, 1945. Canadian production of unrefined lead in March totalled 31,287,569 pounds against 30,477,148 lbs. in February and 35,169,939 lbs. in March, 1945.

Production of primary zinc in March amounted to 42,957,226 lbs. compared with 39,784,315 lbs. in February and 47,697,136 lbs. in March last year.

Output of silver was 1,179,862 oz in March compared with 1,045,448 oz in February and 1,199,546 oz in March a year ago.



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Hood Top Forming Dies

CERTAINLY, THEY'RE *Strenes* METAL

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FOR DRAWING AND FORMING DIES

KEEP YOUR PRODUCTION "LIGHT ON ITS FEET"!

Speed Up Tooling Shifts With

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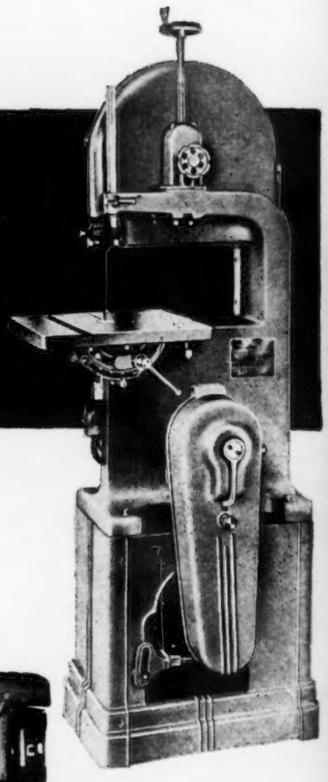
MACHINE TOOLS



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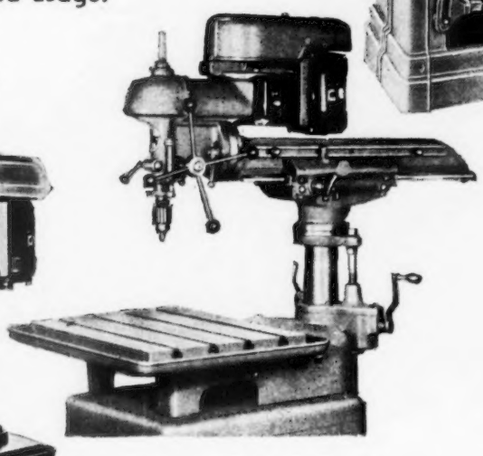

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Universal head travels 21½" on gliding ram. Patented geared motor gets shaft closer to work permitting deeper cuts than where wheel is mounted on center shaft of conventional motors.

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Spindle speeds, 260-5200 R.P.M. permit selection of correct speed for each material. Hand or power feed. Floor and bench, single and multi-spindle models.

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Drills to center of 62" circle. Head tilts 45° right and left. Built-in ball-bearing jack-shaft give spindle speeds from 160 to 830 R.P.M. This permits selection of correct cutting speed for each material.

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